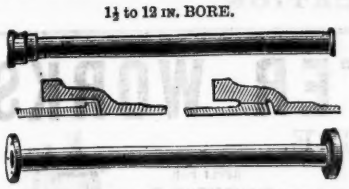
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1684.] LONDON, AUGUST 20, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.



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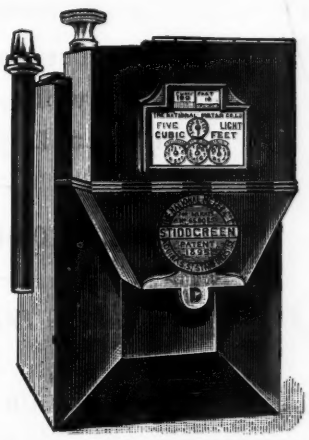

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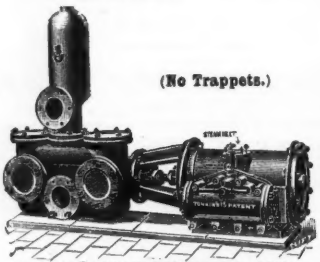

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

TRADE MARK.

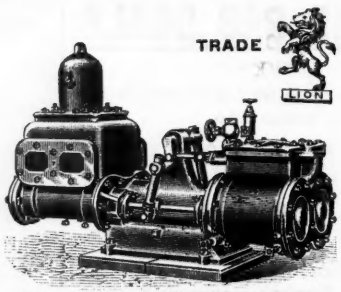

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

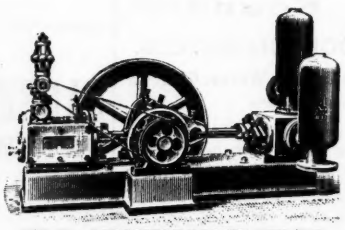

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

APPLY FOR CATALOGUE NO. 8.

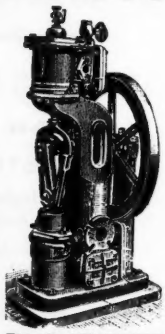

Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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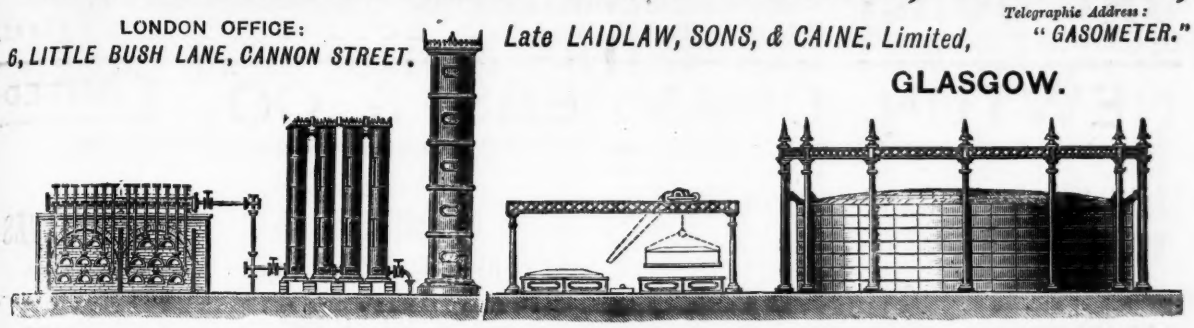

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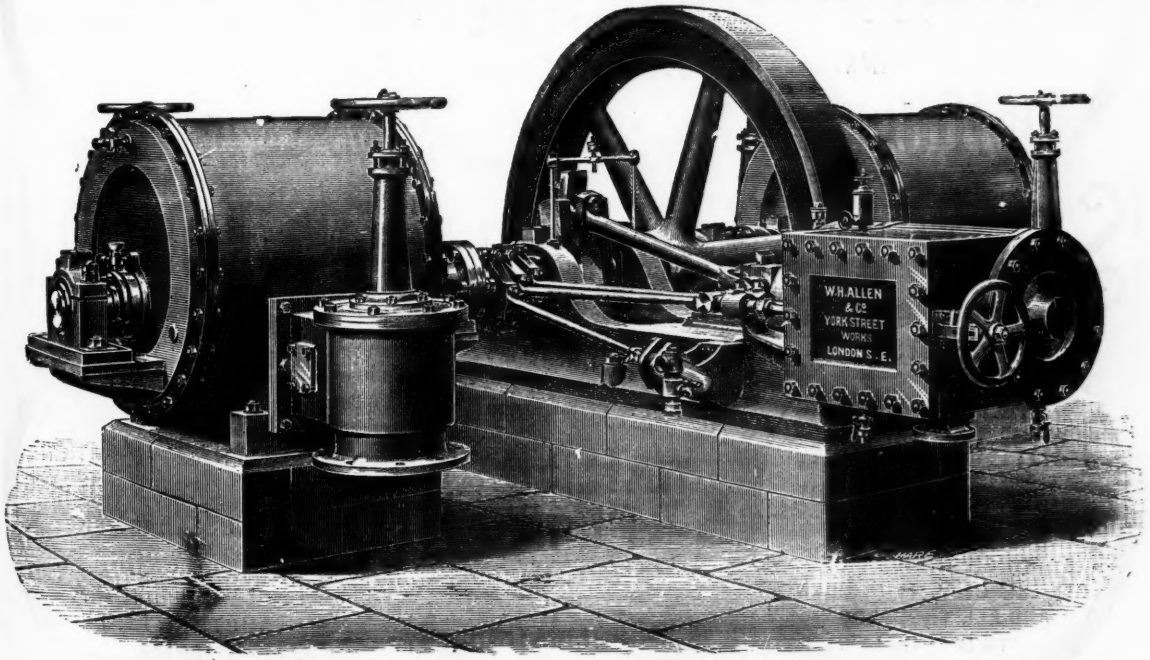

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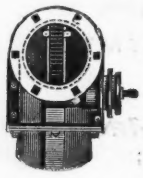

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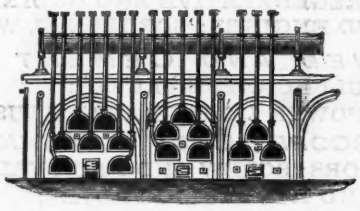

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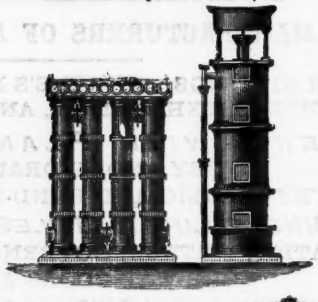

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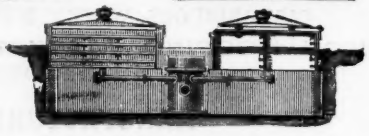

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OVER 100 ERECTED

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WITH NAPHTHALENE
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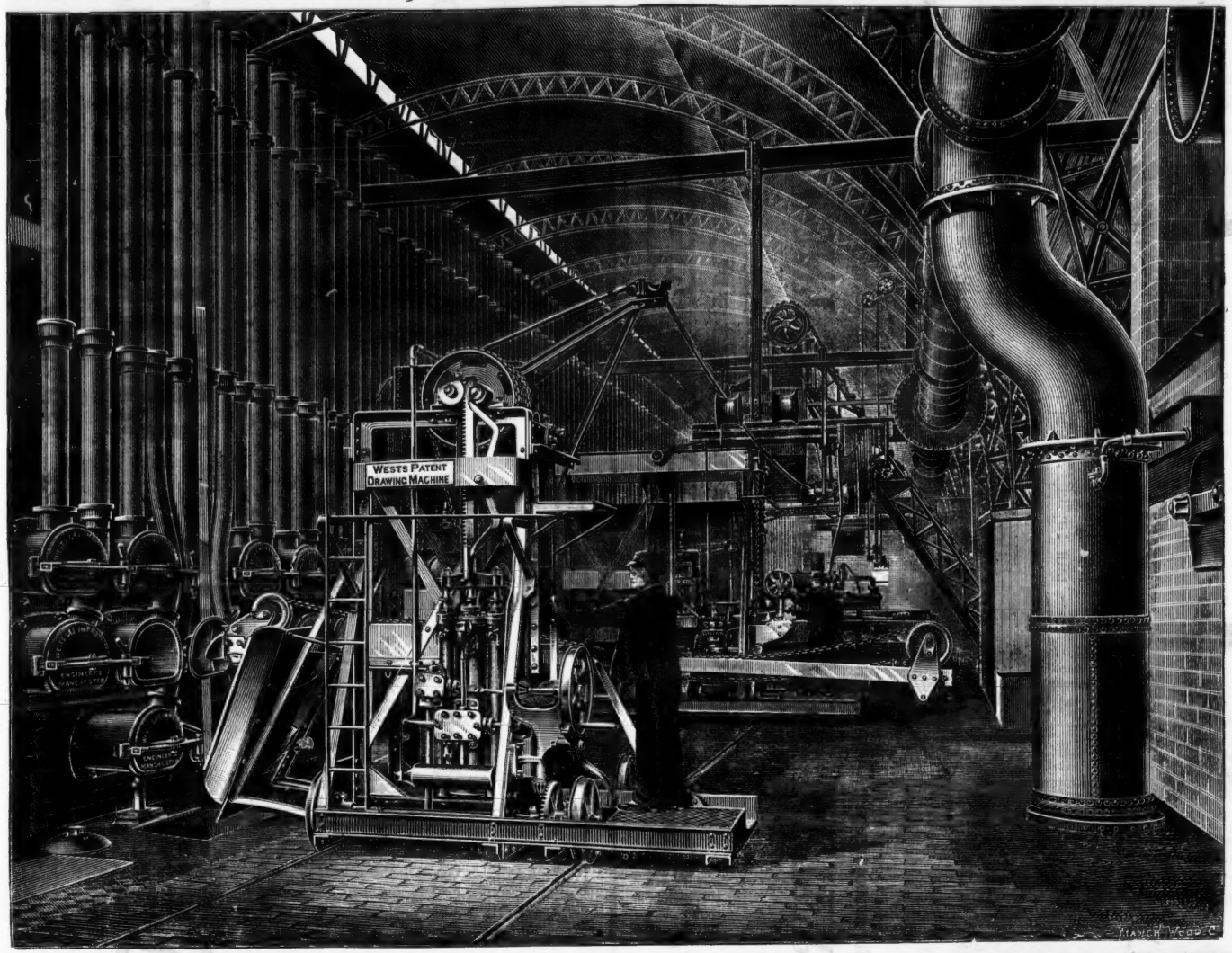

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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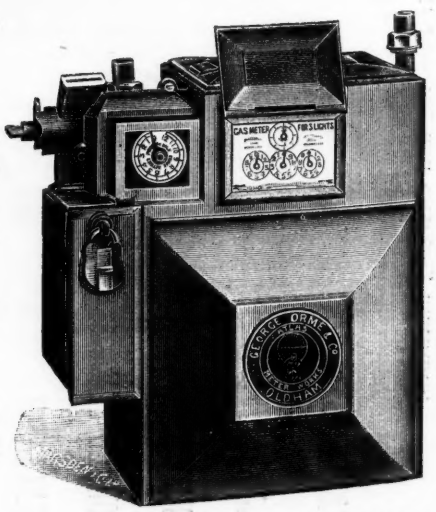

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THE INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

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The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.

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(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.

The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns fitted with flat-flame burners.

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It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

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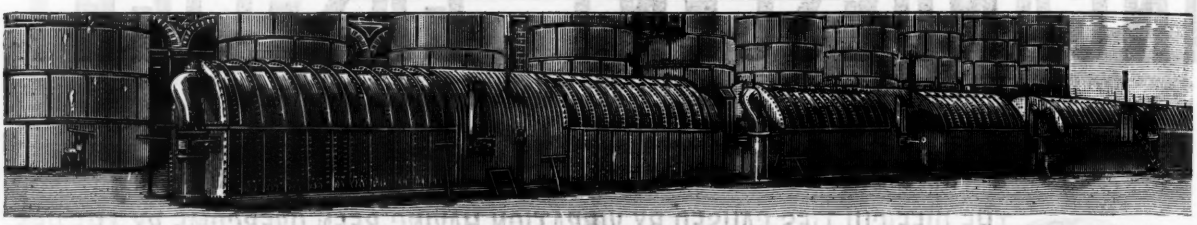

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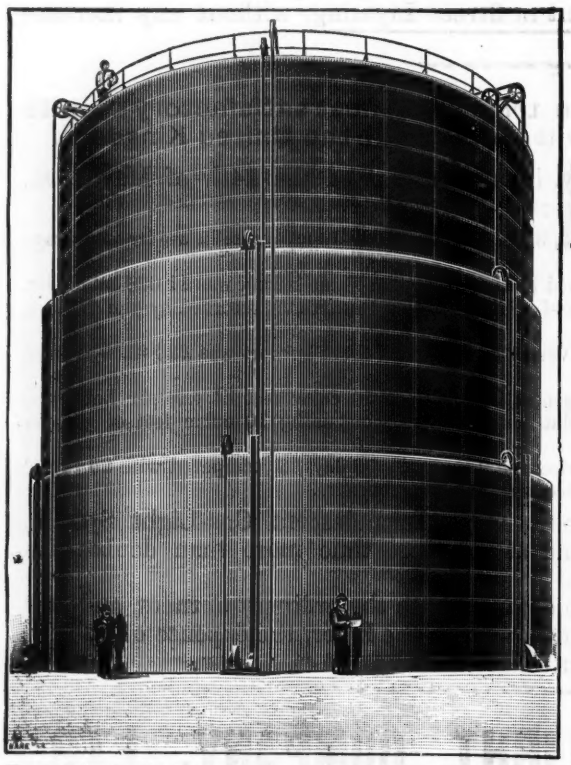

From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

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Pease's Patent Roped Gasholders

THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

MAY BE SEEN AT MANY PLACES.

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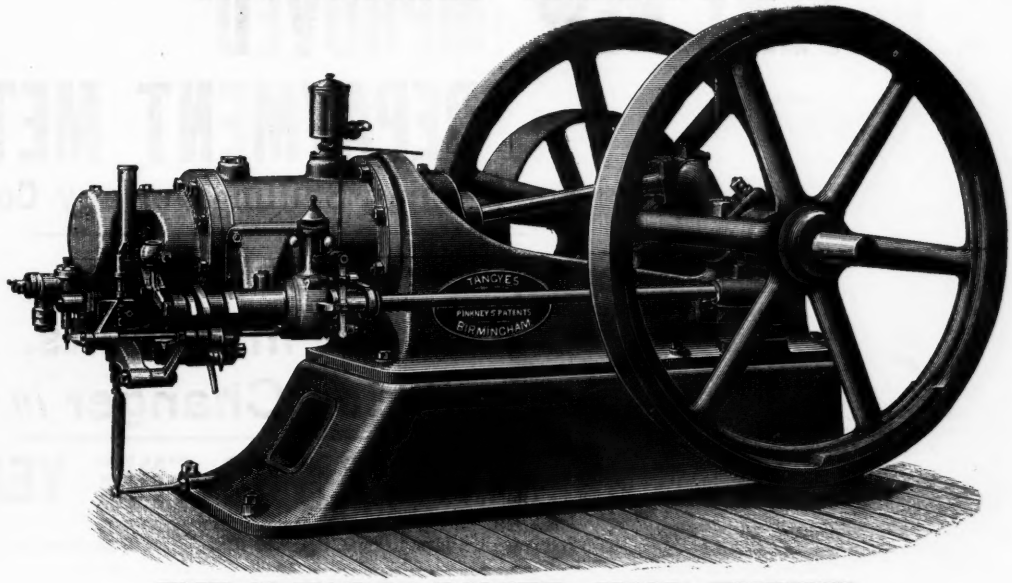

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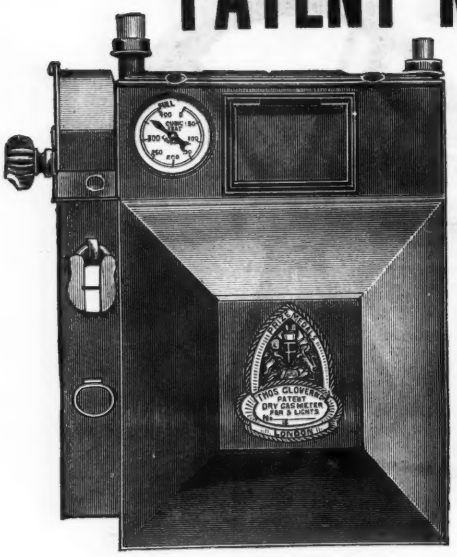

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Price Changer *in Situ.*

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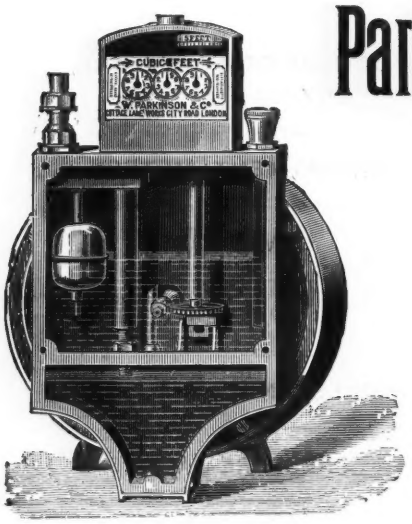

Parkinson's Cast-Iron Case Meter.

Works with very little friction.

Will stand very high pressures.

Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.

Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.

Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

COTTAGE LANE WORKS, CITY ROAD,	BELL BARN ROAD WORKS,
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Telegraphic Address: "INDEX."	Telegraphic Address: "GAS-METERS."

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EDITORIAL NOTES.

The South Metropolitan Meeting.

THE ordinary general meeting of the South Metropolitan Gas Company last Wednesday terminated, as was to have been anticipated, in another personal triumph for the Chairman, Mr. George Livesey. What was hardly to have been expected by anybody, however, and certainly not by Mr. Livesey himself or his declared opponents in this regard, was the apparent ease with which his legislative projects, the "workman director" and all, were accepted by an almost unanimous body of stockholders. It cannot be truly stated that Wednesday's vote was "snatched;" or that he or anybody else put any obstacles in the way of those proprietors who might disapprove of his plans, to prevent their having an effective say in the matter. Notice was given in the Directors' report that an expression of proprietarial opinion would be taken on the question of the expediency of reintroducing the Company's Bill; and we took an opportunity a fortnight ago for urging upon all and sundry of those concerned the expediency of attending the meeting in full force. As a matter of fact, the attendance was by no means large. No unofficial opponent of the Chairman's policy put in an appearance; and consequently it does not now lie in anybody's mouth to cavil with Mr. Livesey for carrying through the plans to which he was known to be committed, and which have received no opposition worthy of the name. It would be affectation to express surprise at the result. When certain gentlemen, writing in our columns last April, referred to the workman-director project as dead and buried, we ventured to hint that, if so, the only epitaph to fit the subject would be a word the truth of which was made manifest last week. We knew our man. Perhaps the weakest part of Mr. Ewart's otherwise unexceptionable little speech on Wednesday was his naive confession that, in face of the Chairman's dogged sincerity in the matter, he had no option of acting otherwise than did the immortal Colonel Davy Crockett's 'coon in similar circumstances.

It is not our desire, however, to publish anything to further irritate the susceptibilities of those well-meaning persons who must now find the ready complaisance of the South Metropolitan shareholders to follow the lead of their Chairman more than a little disappointing. It could have been wished that Mr. Livesey's opponents had made a better fight of it; but now the opportunity for effective warfare is past, it is to be hoped that there will be no further controversy or rancour. For Mr. Livesey's chief adversary, Mr. Ewart, it is possible to entertain the sincerest respect. He does not like the Chairman's project. He has said as much in his place; and the proprietors have decided between the two causes. Unfortunately for gentlemen like Mr. Ewart, the mere dislikes of conscientious and (in the financial sense) qualified directors of the ordinary City type cannot be hopefully set up against the positive counsels of forceful experts like the South Metropolitan Chairman. He, too, is qualified to hold an opinion in regard to a point of administrative policy in respect of the Company; and his qualification is higher and stronger, in the judgment of the proprietors, than that of the opposing section of the Board. This is all done with now. The South Metropolitan Board is united again; and, all being well, an interesting bit of parliamentary business is assured for next session.

It would not be just to the proprietors who composed Wednesday's meeting to merely record their vote of confidence in the Chairman and of acquiescence in his scheme for altering the constitution of the Board, without remarking upon the very high degree of public spirit which this historic vote exhibited. Shareholders in general, and gas shareholders especially, have often and deservedly been held up to opprobrium for their imputed greed, narrowness, and indifference to anything and everything but dividends. The imputation has not always been unjustified; and some of the least worthy of the reflections concerning dividends and prices which have fallen from the lips of directors of the commoner brands of the order have been applauded on occasion by proprietors who appeared content to pose as money-making automatons. But it is due to the South Metropolitan proprietary to say they have never allowed sordid considerations to stand in the way of the higher requirements of the undertaking and the community. On the occasion of the strike, these

shareholders willingly surrendered, in what they perceived to be a right cause, a large amount of the dividend to which they were lawfully entitled. They permitted the Board to do what was considered to be fair to the employees of the Company in the matter of the establishment of the profit-sharing scheme. Now they have gone to a length in the same direction, which it has been freely predicted would never be sanctioned by any gas shareholder, by approving of a new departure in administration of the greatest political importance. Of course, it is open for anybody to say: "It is all Mr. George Livesey!" And in a certain sense this is so. If he were not prepared to lead, his fellow-proprietors could not follow; but being the born leader of men he is, he could still do nothing without his following. Therefore, whatever may be the outcome of the new Bill—whether Mr. Livesey's designs, important as they are politically, turn out to be industrially and commercially barren or the opposite, let the South Metropolitan proprietors be praised for the liberal-mindedness that is undoubtedly theirs. It is no small credit to any body of men now-a-days to be able to follow a leader, as distinguished from merely standing still or "marking time" with somebody occupying this position. Mr. Livesey has asked his fellow-proprietors to follow him into a strange country which some say is peopled with "Gorgons, and Hydras, "and Chimæras dire;" and they are with him, as they probably will be, through thick and thin, for as long as he continues able and willing to remain at the head of the Company.

Meeting of the North of Ireland Gas Managers' Association.

The North of Ireland Association of Gas Managers had a very successful annual meeting at Drogheda on Tuesday last, under the presidency of Mr. P. J. Salmon, of Galway. A satisfactory accession of strength to the Association was at the same time signalized by the election of six ordinary and four extraordinary members, several of whom belong to towns situated outside the geographical boundary indicated by the title of the Association. This is gratifying as an indication that the advantages of an Association of the kind are being recognized throughout the length and breadth of Ireland; but the circumstance was made the occasion for once more raising that question of changing the name of the Association, or taking some other step towards recognizing the widening distribution of its membership, which cannot be easily or summarily disposed of. Doubtless there is room for an "Irish Gas Managers' "Association" meeting all over the country; indeed, the principal difficulty consists in there being only too much room in Ireland for such an institution to comfortably spread itself in. We do not consider that the initial lack of general interest in Mr. Whimster's originating circular finally disposes of the question; and, in point of fact, it would be found that the roll of the existing Association contains many names of gas managers who did not respond to this circular invitation. For all technical purposes, and for most social objects, a gas manager engaged in any part of Ireland will find complete satisfaction in joining the present organization; for when men employed in the same industry meet to hear and talk "shop," it does not matter in the least whether the society which affords this privilege and solace bears a name expressive of a specific localization. The great thing is that the "shop" talk should be good; and that there is enough of it. Next to this paramount consideration comes that of accessibility. To slightly change the meaning of the term, it is obviously useless to go to the trouble and expense of opening a shop in a place where many would-be customers cannot get at it; and Ireland is not provided with a number of centres to which the scattered gas managers can conveniently resort for conference. Any Irish Gas Managers' Association must partake of the nature of a Provincial, not to say a District, Association; and it is an essential condition of the success of the meetings of such societies as there are in England, that they are held in places to which the majority of the members can travel cheaply, and without necessarily spending more than a single night from home. If even this necessity is avoidable, so much the better for the prospects of the meeting. This statement of the Irish case explains the circumstances sufficiently, without reference to other considerations which do not really influence the question.

To return to the proceedings of the Drogheda meeting, we can unreservedly praise the Inaugural Address of the President, which was exactly the kind and quality of composition appropriate to such an occasion. Mr. Salmon gave his audience a clear, practical statement of personal doings and experiences in his own works and district; and the result was all that could be desired of the head of a Gas Managers' Association. He also gave some excellent advice with regard to the benefits to be derived from attendance at technical meetings. There is, indeed, nothing so good for furthering the general levelling-up of a group of gas managers to the datum of their most advanced and experienced members. What Mr. Salmon said upon this head should go home to the class of workers he was addressing, and also to their employers. It is no libel to describe Ireland as a poor country; and it is certainly true to classify the great majority of its gas undertakings as belonging to "a concatenation accordingly." Moreover, most of the Irish gas-works are of considerable age; and as few of the towns they supply have grown to any great extent, there has been little opportunity for modernizing buildings or plant. The men who have charge of such unprogressive establishments are liable to get into grooves, and to go plodding on in the same way year after year, unless they have applied to them the stimulus of association and comparison with their fellows. Hence we most cordially support Mr. Salmon's recommendation that not only should Irish gas managers make the fullest use of all opportunities for meeting together, but also that their reasonable expenses in this regard should be borne by their employers. It would be money well spent.

The rest of the business of the meeting consisted of reading and discussing useful papers by Mr. Martin, of Drogheda, and Mr. Tully, of Sligo, which do not call for comment here. We have to say, however, that we cordially support the latter's plea for the issue of Provisional Orders for Ireland by a Dublin Government department. Dr. W. Ivison Macadam also lectured very acceptably to the Association on the phenomena exhibited by illuminating gas-flames.

An Electrician's Amusement.

Our electrical contemporaries of the first class are admirable chroniclers and critics of matters coming within their proper province; but we must be permitted to observe that when, as not infrequently happens, they undertake to enlighten their readers in regard to points of interest connected with gas supply, they occasionally print great nonsense. Mr. George Livesey mentioned, in his speech at the South Metropolitan meeting, without taking the trouble to discuss, a wonderful farrago of rubbish concerning the Company's profit-sharing scheme recently published by the *Electrical Review;* and last week the same usually sane journal perpetrated a silly and superfluous calumny against gas companies in regard to their wholly imaginary dealings with calcium carbide. The statement starts with the assertion respecting this interesting compound that "few new products have been so extravagantly and so "quickly be-puffed;" the assigned reason being that "the gas companies recognized in it a means whereby "they might solve the hitherto-to-them-almost-insuperable "difficulty of raising the candle power of their illuminant. "At any rate," we are told, "they [the gas companies] "welcomed the advent of acetylene as the advent of a "saviour; and the incense of their thanksgiving arose in "the land." This is news to us, who should know at least as well as the *Electrical Review* what gas companies are doing in the matter of enrichment. Our contemporary proceeds, in the engaging style beloved of electrical scribes, to condole with the "aged and failing" gas companies upon the intelligence it professes to have obtained from a variety of foreign sources that calcium carbide is not the "good "thing" it was at first supposed to be. It also kindly warns those whom it describes as "*quondam* rivals, that all "is not gold that glitters; and that they should not pro-"ceed to adopt a new thing as an universal *panacea* before "they have carefully investigated it." Really, this is very good of our young friend; but the kindness is unfortunately misdirected. There is an old saying about the superfluity of teaching one's grandmother how to suck eggs, which the writer in our contemporary might take to heart before he next essays to instruct the "aged and failing" as to the prudence of observing that caution in adopting novelties which is, at any rate, likely to characterize old age, whatever other qualities may be lacking. It would be

waste of effort to dispute with an electrician the fact of that decrepitude of the gas industry in which he pretends to believe, or one might ask by what physiological law senility is associated with that growth to which—taking the nearest evidence to hand—Mr. George Livesey testifies in the South Metropolitan case. This particular electrical "wheeze" is no compliment to the sagacity of those for whom it is so repeatedly served up; and one would have thought that if they are as scientific as they claim to be, electricians would prefer to look the facts of the lighting trades in the face, instead of trying to amuse themselves by voting gas to be dying or dead. However, if this sort of thing amuses them, it certainly will not hurt the gas industry. With regard to the asserted delight of gas companies in calcium carbide, we can only say that this is as much a figment of the electrical brain as the decrepitude of the companies themselves. We never heard of a gas company buying a pound of the substance for use in carburetting; and if our contemporary will take the trouble to turn to our report of the May meeting of the Incorporated Institution of Gas Engineers, it will discover that gas companies have long since been in possession of better information on the whole subject of calcium carbide than it has been in such belated haste to obtain from other sources, which probably had it at second-hand.

The Independent Labour Party.

THE comment upon the recent General Election which has been issued as a circular to the members of the Independent Labour Party by the heads of this remarkable organization, is a wonderful exercise in apologetics. The party ran 28 candidates, not one of whom secured a seat. Yet, by employing the magic of "proportional representation" computations, it is made out that upon the votes actually polled the party ought to be represented in Parliament by between 60 and 70 members. For the present, however, it seems to be a subject of congratulation to the wire-pullers that they achieved the triumph of the complete and contemptuous rejection by the constituencies of every one of their nominees. Of course, if this pleases them, nobody will seek to take away the source of their satisfaction. It would be remarkable, if it were not such a commonplace of studies in fanaticism, that the circular does not betray the smallest suspicion on the part of its framers—the wire-pullers aforesaid—that their candidates failed from the cause to which they were committed, "the independent "representation of Socialism as a distinct issue," being worthless in the estimation of the electors. Yet to everybody not wilfully blind, the lesson in this regard of the election was clear as print. The Socialists, and all the noisy gangs of Trades Unionists, Social Democrats, and proprietors of "fads" of every kind and hue, had before the election worked themselves into a belief that "the great heart of the people" was theirs, and theirs only. They told themselves and the slightly awed world this; and their newspapers echoed the assurance in the shrillest of "progressive" journalese. As it turned out, not even the half-hearted adoption of American spelling by these tremendous agents of moral force had the effect expected of it. Spelling "Progress" with a capital letter failed to induce the electorate to regard it as the peculiar property of a party; and the whole "program" of the same party did not "go" one whit farther for having the two last letters docked from the word as usually spelt. No, the present is certainly not with the Independent faddists; and Socialism has been laid upon the shelf. The world will not stand still, however, because a few busybodies have discovered their own insignificance. Such of the aims of the Independent Labour Party as are praiseworthy will be accomplished in due course, just as they would have been if no such organization had been heard of. It is only the "flies on the wheel" who will vanish; and they will not be missed.

Mr. Alfred West, the Manager of the Rastrick Gas-Works, has been chosen to succeed Mr. R. G. Shadbolt in the management of the North Bierley Gas-Works, when that gentleman takes up his duties at Grantham.

Mr. F. H. Newman has been appointed Assistant to Mr. C. B. Newton, the Gas and Water Engineer to the Carlisle Corporation. Mr. Newman was with Mr. Newton at Rotherham. The appointment gave rise to a long discussion at the Town Council meeting last Tuesday; the Gas Committee's action in the matter being much criticized. In the end, their minutes were confirmed by a majority of only two.

WATER AND SANITARY AFFAIRS.

THE personal visit paid to the East-end of London by the President of the Local Government Board, and to which we adverted last week, was made the subject of a statement addressed to the House of Commons by Mr. Chaplin, in connection with a couple of interrogations in the interest of the County Council. The plain account thus presented gave so little support to the views entertained by the Progressive party, that Mr. Pickersgill at once endeavoured to detract from the effect of Mr. Chaplin's speech by the carping inquiry "whether the right honourable gentleman "was personally conducted by the District Engineer of the "Water Company when he paid his visit." Receiving a negative on this point, Mr. Pickersgill thereupon slightly modified his insinuation by asking whether Mr. Chaplin was not "accompanied" by the Engineer. Of course, Mr. Chaplin was "accompanied" by several persons, for whose presence he was not responsible. There were others for whose presence he might be held accountable, as, for instance, Sir Hugh Owen, the Secretary to the Local Government Board, and Major-General Scott, the Metropolitan Water Examiner. So far as being "con-"ducted" came in evidence, Mr. Chaplin was in the hands of the local authorities, as exemplified by the circumstance that, on alighting at the Shadwell Station, he was met by three representatives of the Vestry of St. George-in-the East, consisting of the Assistant Vestry Clerk, the Medical Officer of Health, and the Sanitary Inspector. It is only to be regretted that Mr. Pickersgill and Mr. Stuart were not present. But while the suggestion contained in Mr. Pickersgill's question was conceived in particularly bad taste, we find something still worse in the editorial columns of the *Daily Chronicle*. This organ of the Progressives has lately been advancing in its audacity in discussing the water question, until it has become absolutely reckless in its attacks upon the Company. Now at last, because Mr. Chaplin has made a calm and impartial statement of facts relative to the East London water supply, the *Chronicle* denounces the President of the Local Government Board as "the official apologist of that arch-sinner, "the East London Water Company." This is going beyond all bounds, and is of a piece with a subsequent sentence, which says: "Why it should have pleased "the Dictator to place the vast interests of London adminis-"tration in the hands of a man who knows and cares so "little about them as Mr. Chaplin, we do not pretend to "know." We should have thought that such a remark as this would have been impossible, in view of the fact that Mr. Chaplin has taken a step very unusual on the part of a Minister of State, in proceeding to the personal inspection of a district where the interests of the people were said to be suffering. Had Mr. Chaplin come back with a report favourable to the policy of the County Council, he would doubtless have been praised for his public spirit in thus seeking to learn for himself what was the true state of the case. Having made this virulent attack, the *Chronicle* says: "With Mr. Chaplin himself we "have no quarrel." We should think not. The question lies rather the other way, if the President of the Local Government Board thought fit to pay any regard to the *Chronicle* when charging him with utter incompetence and carelessness in the discharge of the duties of his high and responsible office.

If the *Daily Chronicle* has little regard for the official position and reputation of a Cabinet Minister, what can be expected when such a partisan journal has to deal with a comparatively humble functionary in the shape of a Water Company's Secretary? The *Chronicle* one day last week asked what was to be said of a Company, placed in such a situation as the East London, which "is actually "selling for a paltry sum to a neighbouring Water Com-"pany to whom it has no obligations at all, a delivery of "nearly 4,000,000 gallons?" The context of this statement naturally led to the conclusion that there was a "daily" delivery. Mr. Crookenden at once wrote to say that the Company, so far from "selling," were actually "purchasing" that quantity for daily distribution in their district. It might have been thought this little correction would have tamed the fiery spirit of the criticizing scribe. But no such homage to common sense and good faith was forthcoming. It was held sufficient to say that the word "delivery" did not mean every day; and, on the other hand, it was argued that Mr. Crookenden did not

say for how long a period the daily purchase had been in operation. Accusations carried on in such a spirit can, of course, never be met. The actual "selling" amounted to 184,000 gallons per day; while the East London Company were pumping from 45 to 50 million gallons per day into their district. Moreover, Tottenham is inside the parliamentary area of the East London Company, and therefore had some claim to assistance. Another onslaught on the Company has reference to fractured pipes as a source of leakage. The *Chronicle* states that in an interview with one of their representatives last Friday, Mr. Crookenden said no less than 40,000 fractures had been found in the water-pipes in this Company's district. But it appeared that all this mischief was limited to the private pipes belonging to the consumers; the pipes and mains of the Company being in "an excellent condition of repair." However private the pipes may be, the *Chronicle* considers that the Company should have seen in some way that they were repaired "months ago." Respecting the quality of the water, which the veracious *Chronicle* has lately been describing as discoloured, and even "viscous," we find nothing to justify such a description in the monthly report by Mr. Crookes and Professor Dewar. On one occasion, the East London supply was "clear but dull;" and on another, "slightly turbid." On all the other days of the month, Sundays only being excepted from observation, the supply is reported "clear." In regard to quantity, the supply is now on for eleven hours per day—a much longer period than that which is given in districts whence no complaints proceed. But East London is deficient in house cisterns, and hence demands a constant stream.

It is ludicrous to learn that the London County Council have a Committee which has been "inquiring into the "scarcity of the water at the East-end," and has now embodied the results in a report. The Committee need have taken very little trouble in this matter. A reference to "Hansard" will make the true cause perfectly clear. It is a question between 1893 and 1894. The works to be finished next May might have been finished last May, had not the County Council persuaded the Government that there was no need to enlarge the East London Company's reservoirs. The Council will now have to suffer a year's delay with regard to one of their own projects; and the year may be followed by many others. The Transfer Bills cannot be proceeded with any further this year, but must stand over until 1896, when they will be taken up at the stage they have already reached. Perhaps, in view of the present composition of Parliament, the Council will be disposed to let the Bills drop, and proceed solely with their own scheme for bringing in a fresh supply. But the enormous expense involved in drawing water from Wales renders the project hopeless, until actual necessity for its adoption can be shown. It is also generally understood that, before a new scheme can be introduced, the existing undertakings must be purchased. For this reason, the transfer scheme seems to be inevitable, except that the Council have no chance of carrying it unless considerable modifications are admitted. A well-devised Trust, outside the limits of the County Council, would doubtless receive a very considerable measure of approval. Yet the Council would possibly prove strong enough to prevent the adoption of such a measure. If there is any popular demand for superseding the London Water Companies, the Council have done little else than block the way.

As the vast population of the country increases, and as new sources of water supply are more eagerly sought for, it is not surprising that those upon whom Parliament has conferred exclusive or prior rights in particular districts should insist on claiming what they believe to be their own. Competition in this respect is destined to become keener as time runs on; and the growing tendency of things is well illustrated by the recent resolution of the Monmouthshire County Council in regard to water schemes affecting the Welsh Principality. Water engineers in great cities that are afar off constantly direct attention towards the watersheds of Wales. The London County Council, as everyone knows, are advised to look thither for the supply of the future, and therefore it is not unnatural that the ruling powers in Wales should view with alarm these constantly threatened encroachments. Hence, doubtless, the resolution referred to, which touches upon the rapidly decreasing area available as a gathering-ground in Wales, and the probability of further inroads being made by English corporate bodies. The Parliamentary Committee of the Monmouthshire County Council have now been definitely charged with the duty of considering and reporting as to the steps to be taken for the conservation to the county itself of such areas as may be necessary for an adequate supply of water for local purposes.

Doubtless it was the same spirit that dictated the above resolution that led the Bradford Corporation to embark in long and costly litigation with the owner of certain lands in the vicinity of their water-works. The defendant, it seems, proposed to deal with the mines and minerals under his land in a way which would, admittedly, result in cutting off an underground stream which sent water into the wells of the Corporation. Now, it is beyond dispute that a similar question was setted by the House of Lords many years ago in *Chasemore v. Richards* (7 H. L. Cases, 349). The point there to be decided was whether an owner of land had a right to sink a well upon his own property, and thereby abstract the subterranean water percolating through the soil, which by force of gravity would otherwise have found its way into springs supplying a river in the flow of which the plaintiff had special interest. It was held that the landowner was within his rights in sinking the well, even though the results indicated would certainly follow. He might do as he pleased with his own, it was said, albeit the purpose he had in view was wholly unconnected with the enjoyment of his estate. So far, then, it must be allowed that the weight of authority was against the Bradford Corporation. There was, however, another aspect of the question upon which much judicial learning has been expended in the course of the litigation referred to—commencing as it did in 1893, and only recently ended by the judgment of the House of Lords, as reported in the last issue of the JOURNAL. By the Bradford Water-Works Act, 1842, the Company then in possession of the works obtained an enactment that, after they had acquired the springs particularly alluded to, no one should divert or appropriate, "in any other "manner than by law they might" be entitled to, any of the water then supplying or flowing from the springs in question. The powers and privileges of the Company under that Act subsequently passed to the Bradford Corporation; and the Courts had to decide what the protective clause meant and what it did not mean—a problem which appears to have been the source of a great deal of forensic argument and of conflicting judicial opinions.

In the first instance, the Corporation were successful in their contention; for Mr. Justice North stayed by injunction the injurious proceedings of the landowner, and ordered him to pay the costs of the action. But, on appeal, this judgment was reversed; Lord Herschell (then Lord Chancellor), Lord Justice Lindley, and Lord Justice A. L. Smith holding that the law sanctioned the defendant's programme. From this decision the Bradford Corporation appealed; and the House of Lords, as already intimated, could see no reason for distinguishing the case from *Chasemore v. Richards* on the broad question of a landowner's rights. The acts done or sought to be done (said the present Lord Chancellor) were done by the defendant on his own land; and the interference with the flow of water was not an interference with water flowing in any defined stream. It was simply a case of percolating water, though, undoubtedly, that water, if not cut off, would have reached the plaintiffs' wells. Lord Halsbury, Lord Watson, Lord Ashbourne, and Lord Macnaghten were unanimous in holding that, on the facts as presented to them, the Corporation had no legal remedy. That, of course, disposes of the whole matter in its elements of general interest and importance. As to the terms of the special enactment on which the Corporation also relied, the Lord Chancellor evidently thought that they had built their belief on a foundation of sand. In his Lordship's view, the Special Act only prohibited people from taking what really belonged to the Company. Doubtless the Corporation thought, as we should be inclined to think, that a prohibition thus restricted in its operation was superfluous. But there is the ruling of the House of Lords; and, for all legal purposes, the final word on the Bradford dispute has now been spoken.

The Verstraeten System of Incandescent Gas Lighting.—It is reported that the Belgian Company who have acquired the Verstraeten incandescent gas-light patents have opened a depôt in a central position on Boulevard Anspach, Brussels, where the brilliant light attracts considerable attention after nightfall.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 409.)

THERE was not any remarkable feature attending the progress of business on the Stock Exchange last week; and perhaps the most interesting item was the settlement after the long 19 days' account. This is a matter which is rarely free from some little degree of anxiety. But it was happily adjusted last week; and the effect was favourable. Fresh business was not very brisk at any time; and things grew quieter as time went on. But prices for the most part did not suffer. Consols and one or two of the choicest gilt-edged securities were a shade lower; but, on the other hand, rails and a few others that wanted a fillip were a little better. Some realizations of profits administered a check here and there; but there was no real weakness anywhere. The Money Market shows no change. Business in the Gas Market began with a great show of activity, though it was largely restricted to the leading issue; but the volume of transactions soon dwindled down, and things became quiet indeed. The tone in general was very firm; but very few changes were made in the quotations until they were corrected *ex div.*, when every issue affected was promoted. Gaslight "A" was very active and buoyant; and prices gradually hardened until at last stock changed hands at 295 *ex div.*, equivalent to 301⅛ with the dividend in it. Hardly anything was done in the secured issues; but they all rose. South Metropolitans were very inactive; but the "C" stock made a nice advance. All Commercial issues, too, were quiet—sellers being scarce. Hardly a bargain was marked among the Suburbans and Provincials; and only Brentfords advanced their figures. Business was just as dull in the Continentals; and none of them made any sign, nor did any of the remoter undertakings attract attention. In the Water Companies it was just the same—transactions being very limited. With the exception of East London, they were firm in general; and one or two made moderate advances.

The daily operations were: Gas stocks opened unchanged on Monday, and closed steady. Business was all in Gaslight issues, which commanded very good prices. On Tuesday, the volume of business was much about the same; but it was more distributed through the list. The only change in quotation was a rise of 2 in Australian. Transactions fell off terribly on Wednesday—everything being very quiet indeed. South Metropolitan "C" rose 2. In Water, Kent rose 2; and Grand Junction, 1½. But East London receded 2. On Thursday, things were just as inactive. But prices held very firm; and South Metropolitan "C" had a further rise of 3. Matters were a little better on Friday, when several issues were very lightly dealt in; but quotations remained unchanged. Saturday's operations were insignificant; and the only variation was a fall of 1 in Imperial Continental.

ELECTRIC LIGHTING MEMORANDA.

The Fortunes of the Edison and Swan Company—The Penalty Clause in Local Authorities' Contracts—The Projected Electric Lighting of York—Analysis of Electric Supply Undertakings' Accounts.

MR. J. S. FORBES delivered an interesting speech at the recent annual general meeting of the Edison and Swan United Electric Lighting Company, upon the results of the second year's working since the expiry of the Company's patents. It is always instructive to watch the further development of business in a speciality after it has ceased to be a monopoly; and in this particular example both the magnitude of the trade and its character are exceptional. Mr. Forbes admitted that, during the period of patent protection, the Company occupied a very advantageous position, being enabled to fix their own prices. When the patent lapsed, there naturally ensued a sharp competition in the trade; and the selling price of incandescent electric lamps fell very considerably. The Company, however, had made their arrangements for meeting the new conditions; and, notwithstanding the pressure of their rivals, the volume of trade done continued to increase. Consequently the Company have been able to maintain their 5 per cent. dividend. An annual turnover of nearly £115,000 for lamps, fittings, and such-like articles, means a large (and, in this case, probably a very reliable) connection; and the Company have reason for rejoicing in what the Chairman described as one characteristic of the English people—a fondness for old favourites, and a disinclination to abandon purveyors of commodities who have served their customers well. In another way, this same characteristic may have been some slight hindrance to the commercial development of electric lighting.

The attention of all companies and others having contracts with local authorities should be directed to the case of the British Insulated Wire Company, Limited, against the Prescot District Council, reported in the JOURNAL for the 6th inst. (*ante*, p. 298), in which it was held by the Court that a contract for the lighting of the streets of Prescot by electricity was void by reason of the absence of a penalty clause from the sealed document. So far as these litigants are concerned, the difficulty has been removed, after a great amount of trouble, by the execution of a new contract; but the point is of moment for all contractors and local authorities, inasmuch as it is shown to be necessary to the validity of all contracts entered into by such bodies, under the Public Health Act, that they should contain a penalty clause. In a general way, such a clause is usually inserted in contracts for public lighting by any system; but there are contracts executed and sealed by local authorities which do not refer to any penalty in respect of non-fulfilment—sometimes because such a provision is regarded as inappropriate or superfluous. It is news to learn that, on this account, no such contract under the Public Health Act could be enforced.

The citizens of York are in a condition of very considerable muddle in regard to a proposed Corporation electric lighting scheme; and it will be some time yet before the matter is straightened out. The duty of preparing a scheme was put upon a Sub-Committee of the Streets and Buildings Committee of the City Council, whose proceedings recall the old tale of the man sent through a plantation to cut the straightest stick he could find, subject to the condition of not looking back. Like him, the York Committee came out of the wood with quite a poor stick. They have been consulting expert after expert; and no two of them were found to agree upon what ought to be done to provide York with a proper central electric lighting installation. Ultimately, they had from as many contracting firms four offers which were regarded as containing some promise of an acceptable result. But, when applied to for definite tenders, only two of these firms responded; and the Chairman of the Committee confessed that if further expert opinion were taken on these offers, it was possible that neither would be approved of. Hereupon a confused debate arose, with the result that the matter was referred back. This was the outcome of five years' incubation. We sympathize with the Committee, and think the desire expressed by several of the members to be relieved of further trouble in this regard is reasonable. It is not a grateful thing to be forced to appear either as standing in the way of the citizens obtaining a fashionable luxury which some may be willing enough to pay for, or as consenting to the expenditure of public money upon a speculative enterprise which is certain to cost the whole body of ratepayers something at the start, and probably for all time. We observe that one earnest and presumably public-spirited partisan of electric lighting assured the Council that there was not the slightest chance of additional burdens being put upon the ratepayers if the scheme were adopted. This assurance has been given elsewhere before; and it has been belied within a few months of its utterance. No representative of the ratepayers of any town ought to offer such an assertion, unless he is prepared to give his bond to indemnify those who may trust in him from all loss in the event of his being mistaken.

In its issue for the 9th inst., the *Electrician* published an analysis of the accounts of some nineteen Provincial electric supply undertakings in a form similar to that followed by the same journal in regard to the Metropolitan undertakings. The limitation of the number of undertakings included in this analysis is perhaps the most remarkable feature of it, especially when our contemporary's explanation of the reasons for this exclusiveness is taken into account. There were, it appears, about seventy Provincial electric supply undertakings working after some sort of fashion at the end of last year; but by far the greater number of these concerns had to be left unnoticed by our contemporary—mostly by reason of their insignificant size, and in many cases because of the unwillingness of the managers to submit their accounts to dissection. Hence the value of the selected abstracts is not great; but still some useful information is to be gleaned from our contemporary's table. Conspicuous, for example, is the reluctance of most of the undertakings to face the question of depreciation. Our contemporary awards a special meed of praise to the Liverpool and Newcastle Companies in this regard. One or two other Provincial electric lighting companies do a little in this way; but the local authorities without exception shirk the necessity, and put their sinking-fund payments in its place. There will some day be an awakening for these heedless ones.

The Directorate of the Ipswich Gas Company.—At a recent meeting of the Directors of the Ipswich Gas Company, Messrs. R. M. Miller and F. H. Fosdick were elected members of the Board to fill vacancies caused by death. Mr. G. A. Biddell was chosen as Chairman, in succession to Mr. Sterling Westhorp; and Mr. D. Ford Goddard, J.P., M.P., succeeds Mr. Biddell in the vice-chairmanship.

The Welsbach Commercial Company.—The formation of this Company, with a capital equal to £1,400,000, to exploit the incandescent system of gas lighting in the United States, was noticed in the JOURNAL for the 30th ult. We learn from *Progressive Age* that Mr. T. Dolan has been elected President; the Vice-Presidents being Mr. Emerson M'Millin, Mr. Randal Morgan, and Mr. C. B. Van Nostrand. The Treasurer is Mr. E. C. Lea; and the Secretary, Mr. S. Mason, who will have for assistant Mr. H. B. Wilson. Our contemporary understands that Mr. A. B. Eilbeck has resigned his position as General Manager of the East River Gas Company, in order to take the management of the new Company.

JOINT-STOCK COMPANY REFORM.

THERE has just been issued, as a Blue-Book, the report of the Departmental Committee appointed by the Board of Trade to inquire as to what amendments are necessary in the Acts of Parliament relating to Limited Liability Companies. The Committee was a very strong one, with Lord Justice Davey at its head. Mr. Justice Chitty and Mr. Justice Vaughan Williams were also members of it, together with several experienced financiers and accountants. Of the need for such an inquiry, it is unnecessary to speak. The joint-stock system has taken such firm root in the commercial world that the only question about it is that of preventing and curing abuses as they are found to arise; for nobody seems able to suggest any feasible substitute for it short of the nationalization of industry, which is outside the range of practical politics. The system is in an eminent degree one that calls for periodical review and revision; while at the same time the difficulty of this task is such that only the strongest and most reputable experts can attempt it with any prospect of success. In the present instance, the revisers must be deemed fully competent; and the fact of their having risen to the occasion, is proved by their having not merely investigated and reported, but also gone the length of drafting a proposed Bill for amending the existing Companies Acts.

The first subject to engage the attention of the Committee was naturally that of the prevention of frauds upon investors. Joint-stock speculation has the unenviable reputation of being cursed with much internal fraud; and the Committee had to distinguish the nature of these frauds, and formulate means for checking them. The report begins with some prudent observations upon the lines and limits upon and within which legislation can safely as well as usefully proceed in this regard. And here appears the initial difficulty. It is a trite observation, say the Committee, that the Legislature cannot provide people with prudence, judgment, or business habits. It must be remembered that the majority of companies are honestly formed for carrying on a legitimate, though it may be a speculative, enterprise or business; and the business is conducted with honesty and reasonable ability and judgment. After all is said that there is to say against companies, and more especially British companies, the fact remains that an enormous amount of business, not merely in England but for the whole of the world, is now carried on by the aid of British joint-stock capital, and under British management. This fact speaks for itself. It is largely a consequence of the facilities which exist for the formation of companies in this country, and the manner in which, as a rule, these companies are administered and managed. The Committee state that the capital embarked in English companies exceeds that represented by French and German companies together by at least 315 million pounds sterling. The natural inference from this fundamental fact of the situation is that drawn by the Committee—that legislation affecting interests of this magnitude and widespread character demands great caution and care. "Restrictive provisions, which may have the effect of either curtailing the facilities for the formation of companies which bring so much business to England, or of embarrassing the administration of companies, or deterring the best class of men from becoming directors, are not to be lightly entertained." It is therefore happily not a question of dealing "root and branch" with an organically weak or mischievous institution, but of correcting faulty details.

To come to the point, there is the question of the prospectus, which is the invitation to the public to subscribe money for the attainment of the objects ostensibly aimed at by the company. It is generally acknowledged that a person who is asked to subscribe to a new company has practically no opportunity for making any independent inquiry before coming to a decision. So the Committee offer, as a "counsel of perfection," the observation that a prospectus should disclose everything which could reasonably influence the mind of an investor of average prudence. With a view to this ideal, it is remarked that the securing of "the utmost publicity" is the end to which new legislation on the formation of companies should be directed. The law may enforce the giving of information, or supplying the means whereby information may be obtained; but after all the law cannot make people avail themselves of information. "It must be borne in mind," say the Committee, "that in a large number of cases, applicants for shares are indifferent to the terms of the prospectus, as they apply not for investment, but for speculation with a view to sale at a premium." Here, in effect, is at once the weakness and the scandal of the system. Before going into the after-details of the administration and management of companies when once formed, how is legitimate opportunity for investment to be extricated from its present confusion with sheer gambling? Possibly the question goes beyond the scope of the labours of the Committee; but, at any rate, having briefly recognized the existence of the gambling element in those who apply for shares in new companies, the report says nothing further on the matter.

Yet, surely, no projected reform of the law of joint-stock companies which omits notice of this evil of gambling for premiums, is fair to the community. The first suggestion by way of remedy that comes to the surface of one's mind, is that applicants for shares in new companies should be compelled to pay for and hold those shares for some definite period of time—say, a year. But such a proposal is probably futile. Suggestions for dealing with gambling and gamblers generally are. It can usually be demonstrated that they would not work, or would have a contrary effect to that intended, or that they would injure innocent persons. The result is that gambling increases on all hands. It is childish to devise means for keeping promoters and directors straight, and for ensuring that prospectuses shall convey "the truth, the whole truth, and nothing but the truth," while in point of fact both directors and promoters are merely agents whereby the gambler for premiums carries on his little game. Several of the newspaper writers and correspondents who have criticized the Committee's report, admit that, in the case of new companies, the initiatory stage is the all-important one. But while commenting upon the suggestions of the Committee with regard to the prospectus, they fail as a rule to shake off the superstition that the deluding of widows and orphans is the object of the wicked promoter. It is nothing of the kind. What the astute promoter (whom the law should look after) seeks to do is to prepare a taking scheme, which shall strike a sufficient number of gamblers as good enough for them to participate in at the start, with a prospect of getting out of again at the earliest possible moment with a profit made out of somebody else's later confidence in the thing. It is, indeed, a form of the "confidence trick;" and it is played in very much the same way as the original swindle. The gambling applicant for shares does not ask himself whether he believes or disbelieves the statements of the prospectus. All he cares to make up his mind about is whether the scheme is likely to go in the market; and the consideration that most weighs with him in this connection is not what he thinks of the prospectus, but how the eventual gull is likely to take it.

One consequence of this state of things is that it is impossible to launch the fairest enterprises—meant in the best of good faith to succeed, and having good prospects of doing so—without following a long way in the paths marked out by the fraudulent promoter, copying his practice, and paying dearly for the lesson. All this is due to the impracticability under existing arrangements of differentiating the true investor from the premium gambler. If the latter could be suppressed, those of the promoter order who pander to him would find their most profitable occupation gone.

We have no space for presenting even an abstract of the Committee's report and the Draft Bill. They deal with such matters as the Memorandum of Association, the allotment of shares, the qualification of directors, the statutory meeting, and so forth. It is curious to note how repeatedly the Committee are driven to confess their inability to suggest remedies for admitted evils, or to supply the most glaring shortcomings of the existing system. Take the question of the Memorandum of Association and its signatories. The Act of 1862 states that any seven persons associated for any lawful purpose may, by subscribing their names to a Memorandum of Association, and otherwise complying with the provisions of the Act as to registration, form an incorporated company. There can be no doubt that it was the intention of the Legislature that the signatories of this document should be persons really interested in, and of some importance in connection with, the formation of the company. But the practice has become very different. The Memorandum of Association is rarely signed by the real promoter, or by anybody who intends to take an interest in the company; but the seven signatories are, as the report puts it bluntly, mere "dummies." This practice has come to be perfectly well understood. It hurts nobody, and is not without its conveniences. But, all the same, it is difficult to believe that the intentions of the framers of the provision are borne out by it. The Committee remark upon this head that "it is easy to criticize the mode of forming companies above described, but not so easy to suggest any reform which is free from objection." Accordingly the Committee do not offer any suggestion, good or bad; but it strikes one that, at any rate, the farce of the seven signatories might be discontinued in favour of something like an application for a licence to trade under a registered name.

The report comments with legitimate satisfaction upon the fact that *pseudo* joint-stock companies—like that instanced in the case of the "Duke of Plaza Toro, Limited," in which the form of a company is only assumed by individuals or firms for their own ends—are not legal. When it comes to a question of distinguishing between perfectly legitimate "private" and "public" companies, however, the Committee again confess themselves at a loss. It is the same with regard to the limiting of the amount of borrowing to be permitted to companies. There is no subject of greater importance connected with company administration, or on which the Committee were favoured with more suggestions, than the question of the restrictions and limitations to be placed on the mortgaging powers of a company. Yet the Committee are of opinion that it would be impracticable to attempt to fix any such proportion. The Draft Bill, however, fixes certain conditions which are to be fulfilled before a company can legally borrow money at all, or even commence business. If the Bill becomes law, no company will be able to proceed to allotment unless a certain minimum subscription has been received; and until shares to the same amount have been allotted and partly paid up in cash, and the directors have duly qualified themselves, no business of any

kind can be undertaken. The Bill, moreover, is unique in respect of containing clauses setting forth the general law with regard to the duties and liabilities of promoters and directors in connection with the promotion of companies and the issue of prospectuses. The Committee did all this because, as they explain, "their experience leads them to believe that the principles of law and commercial morality, long since adopted and acted upon by Courts of Law and Equity, are not generally recognized, or, if known, are frequently overlooked and disregarded." This is a strong indictment of the genus "City man;" but it is not undeserved. Fortunately, the Committee also think that these principles of law, if thoroughly grasped, leave little to be desired so far as concerns the general principles which should regulate the dealings of men of business in this matter. It is a novelty to hear of principles of law and morality being embodied in an Act of Parliament; but, after all, the new clauses do not bulk very large in the Draft Bill.

The question of when companies may or may not declare a profit and pay a dividend is another of the problems which the Committee reluctantly declare themselves to be unable to solve. Although, as we have already remarked, some of the most urgent questions of company reform are thus passed over by the report, it would be wrong to suppose that this is anything but a most instructive and valuable statement of the law and the merits of a highly complicated subject. As we are now credited with having a businesslike House of Commons, the matters dealt with in this report may be further discussed at no distant date, with a view to fresh legislation on the subject.

Mr. C. H. Priestley has been appointed Engineer and Manager of the Cardiff Corporation Water-Works, in succession to Mr. J. A. B. Williams, whose resignation of the position was announced in the JOURNAL some few weeks since. Mr. Priestley was previously the Engineer; and the Water Committee recommended the Council to entrust him with the additional duties appertaining to the managership, at an increased salary. The Council, however, decided to advertise the appointment; but in the result they followed the advice of the Committee.

Presentation to Mr. D. Ford Goddard, M.P.—A very interesting gathering took place in the St. Clement's Memorial Hall, Ipswich, last Wednesday, on the occasion of the presentation of a testimonial to Mr. D. Ford Goddard, J.P., M.P. Until a short time ago, Mr. Goddard was President of the St. Clement's People's Pleasant Sunday Afternoon Class, which ceased to exist, but has now been revived; and the members, in conjunction with those of the Men's Guild, numbering together about 500, testified their high and sincere appreciation of his work among them by asking his acceptance of an illuminated address. Mr. Goddard, in acknowledging the gift, expressed his pleasure at again taking up the work of the class and renewing associations which were fruitful of pleasant memories. He said it was very gratifying to know that what he had done had yielded some fruit. In the course of his remarks, he referred in appreciative terms to the establishment of what are known as "University settlements," and announced that, in conjunction with other gentlemen, he had taken steps to start one in Ipswich, which he hoped would be joined by a large number of working men.

Death of Mr. R. W. Brownhill.—We regret to record the somewhat unexpected death, on the morning of Sunday, the 11th inst., of Mr. R. W. Brownhill, of Walsall, whose name is so well known in connection with the introduction of "penny-in-the-slot" gas-meters. Deceased took a prominent part in the municipal affairs of Walsall; and he was elected a member of the Town Council in 1867—becoming an Alderman a few years later. He was elected Mayor in 1872, and occupied the position till the year 1874—finally retiring from the Corporation in 1880. During the greater part of his period of office, he was Chairman of the Gas Committee of the Corporation. His tenure of this position was remarkable for the large profits made at the gas-works, and it was also notable because at the same time the price of gas was, we believe, lower at Walsall than in any other place except Leeds. He rendered great service to the town in negotiating for the purchase from Birmingham of their plant, mains, &c., in 1876; thus ensuring to the Corporation the sole right to supply gas at Walsall. The deceased was well known as an inventor and patentee. His patents for brickmaking machinery and other matters were very practical and successful; but perhaps the invention that has made his name best known is the prepayment gas-meter. The deceased was busily engaged in developing this system at the time of his death. During his connection with the Corporation, Mr. Brownhill devoted nearly the whole of his time to public matters of a municipal nature; and in conjunction with the late Mr. Samuel Wilkinson, the Town Clerk of Walsall for so many years, he laboured hard and successfully to develop the rapidly-growing borough. Mr. Brownhill practised as an engineer, arbitrator, and valuer, and was 61 years of age. It is noteworthy that he belonged to a family which has given three Mayors to the borough—the other two being Alderman W. Brownhill and Mr. T. P. Brownhill, both of whom are still members of the governing body. Being of great amiability of disposition, conciliatory, resourceful, and generous, deceased made many friends, who will deeply regret his removal from among them.

NOTES.

Some American Views on Wind Pressure.

In a paper presented to the American Society of Civil Engineers, Mr. Guy B. Waite reviewed the current practice of bracing the high buildings, now becoming fashionable in certain cities of the United States, to resist wind pressure. In the paper, the maximum distributed wind pressure for the highest buildings was taken at 30 lbs. per square foot, which is the lowest given by any known standard authority. The formula used for the reduction of wind pressure from velocity was recently derived from experiments made at Mount Washington, and is given in Johnson's "Theory of Framed Structures" as follows: Wind pressure, $P = 0{\cdot}004v^2$; where v = velocity in miles per hour. This formula gives smaller pressures for corresponding velocities than most of the older formulæ generally employed in such computations. In discussing the paper, Mr. Leverich spoke disparagingly of all existing methods of determining wind pressure; declaring that but little practical value attaches to Sir Benjamin Baker's Forth Bridge experiments in this regard, because they give discrepant and unreasonable results. Mr. Leverich went on to state that in these latitudes it has almost invariably been observed, when high winds have caused destruction to buildings, that the glass in the windows, the lighter vertical walls, and sometimes the roofs, have been first thrust outward—indicating that the moving forces were consequent upon a difference at the time in pressure between the air within and without the structure, the latter being much the smaller. This seems to show that the current assumption in regard to the action of high winds, that they produce a great inward pressure on structures, is erroneous. Such information regarding the whole subject as engineers possess is based upon records of wind velocities at times of notable disturbance, measured in a manner which did not register the effects of extreme waves or pulsations of movement. The effects of the partial vacuum produced on the leeward side of structures exposed to a high wind are also little known. In replying upon the discussion, Mr. Waite remarked that the statement often made, that window-glass would be ruptured by much lower wind pressures than are usually calculated upon, and hence that such pressures are chimerical, is mistaken. By actual computation, it can be shown that a pane of glass $\frac{3}{16}$ inch thick, and 36 inches wide, fixed at its two ends (as well-puttied window-glass is held), is able to withstand pressures in excess of anything ever assumed as acting against a structure.

The Oxy-Coal-Gas Blowpipe.

Mr. H. U. Warren observes, in the *Chemical Trade Journal*, that the difficulty of manipulating with hydrogen gas in conjunction with oxygen, when a high temperature blowpipe flame is desired, has long operated to induce experimenters to accept coal gas as a substitute for the hydrogen. This agent, although suitable for use in the lime-light, develops a temperature far inferior to that obtainable with pure hydrogen. During the past season, the author says he has had occasion several times to test the comparative efficiency of the two mixtures. Various refractory substances which melted readily under the action of the pure oxy-hydrogen blowpipe flame, were observed to obstinately resist liquefaction when subjected to the coal-gas and oxygen flame. Mr. Warren asserts that a blowpipe flame fed by a mixture of coal gas and oxygen, even when both gases are at the same pressure, is very weak in action; the most serious drawback being the difficulty of obtaining a uniform flame—first the outer part of the flame is hottest, then the inside of it. Mr. Warren suggests an electric water-decomposing arrangement for overcoming the difficulty of using pure hydrogen; but the observation respecting the uncertainty of the oxy-coal-gas flame, opens the question of the value of previous perfect admixture of the gases, as in the Denayrouze light.

The Preparation of Concrete.

An interesting question respecting the origin of some of the inequalities of strength observed in different specimens of cement concrete, is raised by Mr. T. Dunken Paret in the current number of the *Journal* of the Franklin Institute. The author remarks that nearly all formulæ for the preparation of concrete and articles referring to the subject produce a general effect of vagueness. In other words, while certain facts and figures are given which are definite and specific enough, there is a general vagueness in regard to that secret of quality which (the cement being assumed to be of uniform excellence) really lies in the proportioning of the filling to the volume of the interstitial cavities. The author observes that, if an absolute rule could be discovered by which proper proportions could in all cases be arrived at, such a rule ought to be of inestimable value, not only in relation to the preparation of concrete, but also in regard to the proportioning of very many mixtures. Certain facts leading to the establishment of such a rule appeared in a series of investigations concerning the manufacture of emery wheels, which had their origin in a curious discovery respecting the durability of such wheels. A number of wheels made in exactly the same way were found to differ greatly in wearing power; and as there was ample evidence that the difference was not in the quality of the emery, inquiry was instituted, with the result that it was found to relate to the amount of interstitial space. Carrying the analogy from the composition of an

emery wheel to that of concrete, Mr. Paret argues that, while the crushing strength of the latter is no doubt largely affected by the cleanness, roughness, and angularity of the freshly-crushed stone surfaces, and by the areas of the lime and silica which are in contact, it nevertheless must be largely affected by the amount of filling being properly proportioned to the interstitial space. He accordingly proposes that, when concrete is made in large quantity, a cubic foot box should be prepared, filled with the rough material, and the amount of interstitial space ascertained by filling it with water. The result would be a guide to the proper quantity of filling required to produce a homogeneous mass.

Mr. J. W. Helps and the Polytechnic Movement.—The Committee of Management of the Croydon Polytechnics have lately issued their annual report. It is a record of extraordinary success. At the central institution in Croydon, which was opened during 1892, the individual students numbered in that session 360; and in the following year there were 678. In 1893-4 there was a slight falling off, owing to the opening of branches at South Norwood and Thornton Heath; but this year the numerical strength of the institution has been brought up to 706, and the class entries to 996. Our contemporary *London* attributes this success to the interest taken in the work by the Committee of Management, the Chairman of which is Mr. J. W. Helps, Assoc.M.Inst.C.E. To him the Polytechnic is indebted for guidance on matters affecting the mechanical department; Mr. T. Cushing, M.Inst.C.E., advising on electrical subjects.

The Management of the Ryde Gas Company.—In the report presented at the annual meeting of the Ryde Gas Company last Thursday, the Directors referred with regret to the death of the Engineer and Secretary (Mr. G. Garnett, M.Inst.C.E.), and recorded their high appreciation of the efficient services rendered by him to the Company for a period of 36 years. Mr. Garnett's decease necessitating fresh arrangements, the Directors appointed temporarily, until June 30 last, Mr. A. E. Coombes as Secretary, and Mr. F. F. Farrand as Manager. These officers having worked most assiduously in the Company's service, the Directors subsequently decided to give Mr. Farrand the position of Engineer and Manager; and they recommended the shareholders to retain Mr. Coombes as Secretary. This was agreed to. As both departments have already shown careful and successful working under the supervision of these gentlemen, who have been with the Company close upon twenty years, the interests of the undertaking will, we are sure, be perfectly safe in their hands.

The Removal of Sulphur from Iron.—A method by which sulphur is removed from iron by the agency of barium ferrocyanide has been successfully employed by M. Vathaire. The ferrocyanide decomposes by heat into iron, carbon, and barium; and the last-named element combines with, and eliminates, the sulphur. The salt is obtained by mixing boiling concentrated solutions of potassium ferrocyanide and barium chloride. If the former is in excess, a double salt of potassium and barium ferrocyanide is obtained, which gives better results than the single salt. It is necessary that the salt should be freed from water of crystallization before being used, as the oxygen therein, on the sudden decomposition produced by contact with the molten iron, would combine with the potassium and barium, forming inactive oxides. The action must be effected with the exclusion of all air and oxidizing influences. Practically, the metal from the blast-furnace and the reagent might be revolved in a vessel lined with limestone, mixed with tar, and allowed to settle to separate the sulphurous slag. This process is applicable more especially to practically pure iron, when very little reagent is necessary. In the case of highly sulphurous metal, a preliminary reduction of the sulphur by one of the known methods is recommended.

The Platinum Unit of Light.—At a recent meeting of the Berlin Physical Society, Dr. F. Kurlbaum gave an account of his determination of the unit of light made in conjunction with Professor Lummer. The unit was based on the light emitted by white-hot platinum foil. Since the radiant energy varies with the temperature, it was necessary to keep the latter constant for a prolonged period, and to be able to re-establish it at any time. This result was arrived at bolometrically by measuring the ratio of the total radiant energy from the glowing foil to the radiation taking place across an absorbing medium. This ratio is dependent upon the temperature of the radiating body, and provides a trustworthy measure of its temperature. It was necessary to find some covering for the bolometer which should absorb all rays as uniformly as possible. After many experiments, a layer of platinum black was found most suitable for this purpose. The absorbing medium employed consisted of a thin layer of water in a quartz cell. The energy radiated from the heated foil passed through a diaphragm of known aperture, the temperature of which was the same as that of the bolometer. The errors in determining the unit of light amounted to 1 per cent., due chiefly to the air currents on the surface of the foil. The unit can now be established at any time in the Imperial Physico-Technical Institute of Berlin; but in order to facilitate its accurate establishment at any other place, experiments are being made to determine the temperature of the glowing foil from the ratio of the radiation over the range of the visible spectrum.

COMMUNICATED ARTICLE.

THE SEPARATION OF CARBON IN FLAMES.

By Harold B. Dixon, M.A., F.R.S.,
Professor of Chemistry in the Owens College, Manchester.

My article in the Journal of Jan. 29 last (p. 214), on the separation and burning of carbon in gas flames, led to a letter by Mr. W. Young on Feb. 12, and to another article by Mr. Thwaite on June 18. These communications require, I think, some answer, because my position appears to have been somewhat misunderstood.

My object in writing was to expose two fallacies which have long been current—

(1) That carbon is separated in a luminous gas-flame by reason of the *selective* combustion of the hydrogen combined with the carbon.

(2) That the glowing of the separated carbon is entirely due to the combustion of gases going on round it.

I took some pains to point out that Sir Humphry Davy had given the correct theory of the separation of the carbon—viz., that it was due to the decomposition *by heat* of the hydrocarbons in the centre of the flame. Faraday, on the other hand, said that the separation of the carbon was due to the hydrogen of the hydrocarbons burning first. I quoted the passages bearing on the question from both writers. Mr. Thwaite says that the theory enunciated by Faraday was that introduced by Sir H. Davy; and that I have now challenged this theory, which he calls the "Davy-Faradaic" theory. I fear from this that Mr. Thwaite has not followed me.

My readers must bear in mind that we are not discussing whether, in a luminous gas-flame, the hydrogen burns before the carbon with which it was combined in the original gas. We are discussing the reason why the hydrocarbon is so broken up in the flame as to yield the carbon in the separate and solid form. Davy said the hydrocarbon was broken up by heat into hydrogen and carbon; Faraday and his school said the hydrocarbon was broken up by the preferential combustion of the hydrogen, because the hydrogen had a stronger attraction for oxygen than the carbon had. Like many other chemists, I accepted Faraday's view that hydrogen at high temperatures had a stronger attraction than carbon for oxygen, until I found that various hydrocarbons, when fixed with a limited quantity of oxygen, did not yield free carbon and water, but always gave carbonic oxide and free hydrogen. It has been objected to this that the conditions of a gaseous mixture exploded in a closed vessel are not the same as those of a flame burning in the open air. I grant that the conditions are not identical; but the experiments show that, at very high temperatures, where the hydrogen and carbon have equal choice of oxygen, the hydrogen has not a stronger attraction than carbon for it, but that the exact contrary is true. Professor Smithells found the same result at lower temperatures in the partial combustion of hydrocarbons with air.

I think it is perfectly legitimate to argue from these results that, in a luminous flame, the hydrocarbon is not broken up by the selective or preferential combustion of the hydrogen. But whether this argument is "obviously untenable," as Mr. Thwaite says, or not, one result has followed our discussion. In his former article, Mr. Thwaite said that the hydrogen of the hydrocarbons burnt first, and that it was in consequence of this superior activity of the hydrogen that the unconsumed carbon was separated. Mr. Thwaite now says the hydrocarbons are broken down by the high temperature in the inner part of the flame. This is exactly the point I was contending for.

Let us compare these two passages from Mr. Thwaite's articles—

Jan. 8, 1895.

As the sequence of action of luminous combustion the following equation [is given]:—

Equation A.

Combustible.	Action.
$2H + C$.	1st. $(2H + O) = H_2O$
	2nd. Interval of incandescence of liberated carbon.
	3rd. $(C + 2O) = CO_2$

In the non-luminous combustion, the equation may be represented as follows:—

Equation B.

Combustible.	Action.
$2H + C$.	1st and only action $(2H + O) + (C + 2O) = H_2O + CO_2$.

June 18, 1895.

The author's experience . . . has satisfied him that the stability of nearly all the hydrocarbons is destroyed when brought under the influence of temperatures above 2000° Fahr. This thermic influence induces hydrocarbon decomposition.

The oxidation of the free hydrogen, as well as of part of the hydrogen of the decomposed hydrocarbons, establishes a zone of high temperature. In this zone the hydrocarbon structure, still undecomposed, collapses; and both the hydrogen and the carbon are set free.

The formula of complete thermolysis, applied to one of the simple hydrocarbons, may be thus expressed:—

C_2H_6 + thermolytic influence = $2C + 6H$.

Now the expression $2H + C$ applied to the combustible in Equation A can only mean the undecomposed hydrocarbon. For the *first action* in "the sequence of action of luminous combustion" is said to be the splitting off of the hydrogen by its union with oxygen; and in Equation B the same expression is used for the combustible which all agree is not decomposed before it is burnt. I hope, therefore, I do no injustice to Mr. Thwaite when I say that these two passages express entirely

different views. The first is Faraday's; the second is Davy's. The latter I believe to be in the main correct.

Concerning the second fallacy, I regret our discussion has not brought about the same agreement. Mr. Thwaite imagines that the solid carbon particles shining in the flame are *single atoms*, and therefore cannot give light when once they are attacked by oxygen. It follows from this that Mr. Thwaite thinks that an atom or molecule of carbon is a "solid" capable of emitting and reflecting white light, but that a molecule of carbonic acid is a "gas" incapable of doing either. Now, Mr. Thwaite has referred to Soret's researches on the polarization of sunlight by luminous hydrocarbon flames. Will he take M. Soret's word for it that light is not polarized by atoms, but only by solid particles consisting of large aggregates of atoms? "Each particle of carbon," says M. Soret, "although very minute, is composed of a great number of molecules."*

Mr. Young's interesting letter published in the JOURNAL on Feb. 12, if I rightly understand it, maintains two propositions—

(1) In a luminous gas-flame, the hydrocarbons are decomposed by heat, and the hydrogen, thus severed, burns more quickly than the separated carbon.

(2) The carbon of a hydrocarbon, whether in a luminous flame or in an explosive mixture, does not combine directly with free oxygen, but is oxidized by the steam first formed.

Regarding the first proposition, my only quarrel with Mr. Young is that he supposes that I maintain the contrary opinion. To the best of my knowledge, I have never thought or said so. The whole point of my former article was to show that carbon was not separated in the flame by selective combustion of the hydrogen. I said nothing about what happened to the hydrogen or carbon *after* they were separated. When I spoke of the superior affinity of carbon over hydrogen for oxygen, the context shows that I was referring to high temperatures and to conditions under which both had equal chance of oxidation, as in the explosion of hydrocarbons with oxygen, and the passage of steam over a mass of highly-heated carbon. I never contended that, under *all* conditions, carbon would be burnt and hydrogen left. I did not suppose, for instance, that, if a lump of charcoal were placed in a mixture of hydrogen and oxygen, and the gases were fired by a spark, the carbon would be oxidized and the hydrogen escape combustion. In the same way, in a luminous gas-flame, when the hydrocarbons are decomposed in the interior of the flame, the liberated hydrogen, by its quicker movements, would, I have never doubted, be the first to reach the oxygen molecules coming from the outside. This is precisely the gist of M. Berthelot's letter published in the JOURNAL on the 5th of March. If you explode, he says, diazo-benzene nitrate, you find the carbon is oxidized, and the hydrogen is left unburnt. In this experiment, which is analogous to mine, the carbon and hydrogen are both raised to a high temperature, and have equal chances of securing the oxygen. There is a preferential combustion in favour of the carbon. So far, M. Berthelot and I are agreed. "On the other hand," he says, "there is the progressive incomplete combustion of the hydrocarbons, which furnishes acetylene and carbon, and at the same time water. If the carbon always burnt in preference to hydrogen in the hydrocarbons, there ought not to be produced either acetylene or free carbon." Here I part company with M. Berthelot, if the translation of his phrase is really accurate. It is *not* necessary for the hydrogen *in* the hydrocarbon to burn first. The hydrocarbon may be decomposed into acetylene and free hydrogen, or into carbon and free hydrogen, after which the free hydrogen burns, and the acetylene or carbon partly escapes combustion. In a smoky flame, this is what happens. The carbon, aggregated into solid masses, does not meet with oxygen sufficient to maintain its combustion until it has cooled below its ignition temperature in air.

The second proposition of Mr. Young is a far more debateable matter. He maintains his belief that oxygen cannot attack carbon except by first uniting with hydrogen, and that it is water, therefore, that always oxidizes carbon. The part played by steam in combustions has interested me greatly for the last twenty years—ever since I discovered that the explosion of carbonic oxide gas with oxygen was brought about by the interaction of steam. At one time I shared Mr. Young's belief; for at that period experiments seemed to show that pure carbon would not unite with dry oxygen, and that cyanogen (the gaseous compound of carbon and nitrogen) required steam to be present in order to make it explode with oxygen. Prolonged investigations, however, have not borne out these views. Pure carbon, though it does not burn vividly in dry oxygen, nevertheless unites with it at high temperatures to form carbonic oxide. Mixtures of pure cyanogen and oxygen, and mixtures of carbon bisulphide and oxygen, explode just as readily when they are thoroughly dried as when steam is present. In the case of carbonic oxide and oxygen, the addition of steam to the mixture up to 5 per cent. *increases* the rapidity of the explosion; in the case of cyanogen and oxygen, the addition of steam to the mixture *diminishes* the rapidity of explosion. We are driven, therefore, to the conclusion that carbon, whether uncombined or combined, is capable of direct union with oxygen to form carbonic oxide.

* Soret, *Phil Mag.*, 1875.

By analogy, we should expect that carbon combined with hydrogen was capable of direct union with oxygen also. If we try the experiment of exploding ethylene or acetylene with its own volume of oxygen, we find as the result that the carbon is burnt and the hydrogen liberated—

$$C_2H_2 + O_2 = 2CO + H_2$$

Acetylene. Oxygen. Carbonic oxide. Hydrogen.

The reaction being analogous, in its result, to the cyanogen explosion—

$$C_2N_2 + O_2 = 2CO + N_2$$

Cyanogen. Oxygen. Carbonic oxide. Nitrogen.

Mr. Young maintains that in the former case the hydrogen is really burnt to water first, and the water so produced is then decomposed by the carbon. But if the carbon in cyanogen can burn direct, why should it go a roundabout way in acetylene? Again, the rate of explosion of gases has been carefully studied by M. Berthelot and myself. In the case of carbonic oxide and oxygen, where we know the oxidation is an indirect one, the rate of explosion is far below the theoretical velocity—whether M. Berthelot's theory be taken as correct or my own. In the case of cyanogen, the rate of explosion agrees with the velocity of a sound-wave in the reacting gases; and we find not merely one coincidence, but that the agreement is maintained in a number of different mixtures. In the case of acetylene and oxygen, the agreement between the calculated and the found velocities is very close, which was to be expected if the carbon was oxidized directly, but is unexplained on the assumption that the hydrogen has first to be burnt.

I cannot follow the argument Mr. Young has drawn from the passage of steam over heated carbon. I understand him to say that because steam, passing over carbon at a moderate temperature, gives mainly carbonic acid, and at a higher temperature mainly carbonic oxide, for the product of oxidation of the carbon, therefore the relative affinity of carbon for oxygen increases with rising temperature, and therefore carbon is always oxidized by means of steam. I am not sure if I am right in supposing the argument to be this. It can be proved that carbon decomposes steam; and this action takes place with greater facility the higher the temperature. Therefore we may readily believe this action is the main one in flames and explosions.

It is true that carbon and carbonic oxide decompose steam at a high temperature. When steam is passed over red-hot carbon, or when carbonic oxide and hydrogen are exploded with a limited quantity of oxygen, or when carbonic acid and hydrogen are heated together, there is established an equilibrium among the *gaseous products* which can be expressed by the following equation:—

$$\frac{CO \times H_2O}{CO_2 \times H_2} = a$$

The constant a varies with the conditions of the experiment. If an *excess of steam* is passed through heated carbon, the temperature falls; and, as the above equation shows, the quantity of carbonic acid is large and the quantity of carbonic oxide small. When the supply of steam is *limited*, the carbonic oxide is large, and the carbonic acid small. I cannot see how these facts affect the question whether the carbon of a hydrocarbon can combine directly with oxygen.

The Autumn Meeting of the Incorporated Institution of Gas Engineers.—We learn from the Secretary of the Institution (Mr. T. Cole), that the autumn meeting is to be held in Liverpool on the 26th and 27th prox.

Boring for Petroleum in Java.—According to advices from Java, boring for petroleum continues to give satisfactory results. In the districts around Sourabaya, the oil wells yield abundantly, and a brisk local trade in the product has sprung up. In Mid-Java also the same industry has been started with success. Pipe-lines have been laid from the wells to the tramway; and tank cars are there filled for despatch to Samarang, where oil warehouses are being built.

The Gaseous Products of Wood Charcoal.—The subject of the gaseous products evolved from wood charcoal when submitted to a high temperature out of contact with air has lately been dealt with in the *Comptes Rendus;* and the matter has been noticed in the Society of Chemical Industry's *Journal*. In an attempt to obtain carbon monoxide gas by passing carbon dioxide from a gasholder over red-hot charcoal, it was found that none of the dioxide could be driven through the charcoal owing to a back pressure due to gases developed from the latter. On the contrary, the disengaged gas, to the extent of 170 litres per kilogramme of charcoal, passed to the receiver prepared for the carbon monoxide. In a laboratory experiment, the volume of gas amounted to 250 litres per kilogramme. That prepared on the large scale contained $CO_2 = 9{\cdot}14$; $CO = 18{\cdot}08$; $H = 49{\cdot}11$; $CH_4 = 16{\cdot}04$; $O = 0{\cdot}26$; and $N = 7{\cdot}37$ per cent. Its antiseptic properties were superior to those of carbon monoxide. The gas is probably due, for the most part, to the destructive distillation of solid, or condensed liquid, organic substances contained in the charcoal. Its formation shows that the equation $C + CO_2 = 2CO$ does not adequately express the result of the interaction aimed at; and it also shows that the carbon monoxide in the gases from burning charcoal is not due to incomplete combustion alone.

TECHNICAL RECORD.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Drogheda.

The Annual Meeting of the North of Ireland Association of Gas Managers was held in the Mayoralty Rooms, Drogheda, on Tuesday of last week. There was a larger attendance of members than at any previous meeting of the Association. The proceedings began shortly after half-past eleven o'clock. Mr. P. J. SALMON, of Galway, the President for the year, occupied the chair.

THE REPORT OF THE COMMITTEE.

The HON. SECRETARY (Mr. James Whimster, of Armagh) read the following report by the Committee:—

The Committee, in presenting their annual report, feel gratified that they have been able to secure such an interesting and attractive programme for this year's meeting.

Last year's meeting in Armagh was a most successful one—the subjects being so thoroughly practical; and special interest seemed to attach to the informal discussion on purification. Although there was no room this year for such an item on the programme (sufficient papers being provided to profitably occupy the whole time available), these papers are of such a nature that there should be every inducement for such a full and free interchange of opinion and experience as will prove of great value to all present, and must accentuate the usefulness of such meetings.

The Committee would call special attention to the lecture by Professor Macadam, on a subject with which he is thoroughly conversant, which is of intense interest to all of us, and which in his hands (and illustrated by experiments and lime-light views) cannot fail to make it the centre of interest in the programme.

The financial statement and Auditor's report show that the Association has at its credit the sum of £23 3s. 10d.

According to Rules 25 and 26, three members of Committee retire, and are ineligible for re-election. The retiring members are Messrs. Hands, Love, and Tully.

On the motion of Mr. C. B. TULLY (Sligo), seconded by Mr. T. M. WALSH (Tuam), the report was adopted.

NEW MEMBERS.

The following new members were admitted:—

Ordinary Members: Thomas J. Reid, Gas-Works, Ballina; W. A. Reid, Gas-Works, Longford; J. Shine, Gas-Works, Bandon; Patrick Egan, Gas-Works, Tralee; John O'Grady, Gas-Works, Castlebar; Geo. Kelly, Gas-Works, Kilrush.

Extraordinary Members.—W. Harding, Secretary, Gas Company, Ennis; Laurence Donegan, Secretary, Gas Company, Drogheda; Daniel Jones, Dublin; C. F. Crabtree, Dublin.

ELECTION OF OFFICE-BEARERS.

The following gentlemen were nominated by the Committee as office-bearers for the ensuing year:—

President.—Mr. T. Frizelle, Holywood.

Vice-President.—Mr. G. R. Love, Dundalk.

New Members of Committee.—Messrs. W. Walker, Hillsborough; J. Dewar, Newtownards; and W. Nisbet, Monaghan.

Mr. D. WILLIAMSON (Clones) proposed the election of the gentlemen whose names had been read by the Secretary.

Mr. M. MARTIN (Drogheda) seconded the motion.

Mr. WALSH proposed, as an amendment, that the name of a southern gas manager should be substituted for one of those proposed. He thought the Committee might take into consideration that there were now a good number of southern members in the Association.

The PRESIDENT said that the reading out of the names did not prevent the members present from nominating others.

The HON. SECRETARY explained that the matter was talked over in Committee; but the difficulty cropped up that there were very few members from the South. Several had just been added to the roll; but perhaps Mr. Walsh himself was the only one they had before.

Mr. WALSH thereupon nominated Mr. T. T. Llewellyn, of Newbridge.

The SECRETARY stated that the three gentlemen who remained on the Committee represented Drogheda, Ballybay, and Mullingar, the latter two of which places they could scarcely call North.

Mr. A. MACKENZIE (Edinburgh) thought the Association should have regard to their funds. They had not too much money in hand, and they should get members of Committee in a central position, because they could attend the meetings of the Committee very much better. He thought it would be advisable if they could appoint the Committee unanimously.

Mr. WALSH said he made the proposal with a motive. He had been speaking to a good many managers in the southern district; and they said they could not see their way to join the Association on account of its being a northern one.

The PRESIDENT said that a year or two ago circulars were sent out by Mr. Whimster, inviting managers to join; and he believed that he and Mr. Tully were the only members who came forward in consequence of this action. He thought it would scarcely be fair to ask all those gentlemen from the North to go so far as Galway, for instance, when there were only two members in that district.

Mr. Walsh thereupon withdrew his proposal; and the nominations as made by the Committee were approved of.

Mr. FRIZELLE thanked the members for electing him President. He considered it a very high honour; and he would do his best, in the office, for the interests of the Association.

Mr. G. R. LOVE (Dundalk) proposed that Mr. Whimster be re-elected Honorary Secretary. He was sure Mr. Whimster was the right man in the right place.

Mr. WALSH seconded the motion; and it was agreed to.

Mr. WILLIAMSON proposed that Mr. E. Stears, of Lisburn, be re-elected Auditor.

Mr. FRIZELLE seconded the motion; and it also was agreed to.

PLACE OF NEXT MEETING.

Mr. FRIZELLE invited the Association to meet at Holywood next year, when, he said, they would try to make them as comfortable as possible.

Mr. WALSH proposed that Athlone be the place of meeting.

The PRESIDENT: I do not think we have any member at Athlone.

Mr. WALSH did not think they should take that into consideration. If they met at Athlone, they might possibly get the gas manager there to join the Association.

The PRESIDENT said the matter was entirely in the hands of the members.

Mr. WILLIAMSON seconded the motion that the Association meet at Holywood, for the simple reason that since the Association was established he did not think it had met in any place in County Down.

Mr. TULLY seconded Mr. Walsh's proposal.

A show of hands was taken, when, by a large majority, it was agreed to meet at Holywood.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty to-day is to welcome you to this old and historic town of Drogheda; and I need not say how pleased I am to see so many here at our eighth annual meeting. My next duty reveals a failure to find words adequate to convey to you my feelings for the honour you have conferred on me of President of the Association—composed as it is of practical men, far more so than I am myself. All I can say is that I am proud of the honour, and thank you for it.

There is considerable difficulty in choosing a subject for what is known as a President's Address. We find ourselves likely to go over beaten ground, quoting the words of others, and seeming ridiculous afterwards. I shall therefore keep as clear of that as possible, by giving you a little of my own experience on the following subjects.

After leaving the meeting last year, where there was a very interesting discussion on lime for purifiers, it occurred to me to go into the matter, and see what I had been doing. This is the system we practise in Galway: I take my lime, which arrives in ten-barrel lots (the lime-barrel measures 24 in. by 24 in. by 18 in., and the contents weigh, when well burned, 165 lbs.), spread it out, and give it about 425 gallons of water. During the application of the water, the lime is turned over several times with a long-handled shovel. The ten barrels, when prepared, will measure from 20 to 25 barrels as it is put into the purifier. I use the lime with more water added than is generally done by the members of our Association. When prepared, the lime has a rough or very coarse appearance; and on removal it requires to be hacked out with pickaxes, it having at this stage the appearance of dark honey-comb. The gas has free passage from start to finish, never giving back pressure. Our lime costs 1s. 4d. per barrel, and will clean about 35,000 cubic feet of gas per barrel of unslacked lime. Our purifiers are eight feet square, with 8-inch connections, and three tiers of grids. The gas enters on the side, about 8 inches from the bottom.

Our 65-feet shaft having become very shaky—the bricks falling from time to time—it was necessary to take some action to prevent an accident. This precaution took the form of erecting a small or dwarf chimney for each bed, as had been adopted elsewhere. This, however, I considered not as good a plan as one chimney for two beds; and I resolved to try one for a season, before erecting the others. Now, having tested the first, and being fully satisfied with the result, we have erected other two—that is, one chimney to two beds of sevens. These chimneys are carried up on a level with the louvre; and during last winter there was a most satisfactory heat with the damper open 3 in. by 12 in. The lower portion of the chimneys is built with fire-bricks laid in fire-clay; and the upper portion is fire-brick inside and Bridgewater outside, with 2½-inch tile on top. Each of these chimneys has a damper for each bed, which controls the draught. The retorts are 8 ft. 4 in. by 21 in. by 18 in. ovals, except the bottom ones, which are round. After adopting the small chimneys, I did my season's work with two beds; and I got a yield of gas of over 10,000 cubic feet per ton, with retorts on their third season's work. My average for three months this year is 10,500 cubic feet per ton. Amongst other advantages derived from small chimneys, is that they can always be got at for repairs, and will show any waste from the retorts at once.

On making preparations for extensions at our works, it was necessary to cut out an old gasholder. Every precaution had been taken—the inlet and outlet pipes were filled with water; and the holder was down. It, however, contained about 4000

cubic feet of gas, owing to the tank being bad; and it was intended that this gas should escape by means of a vent-cock on the crown of the holder, by the manhole when the lid was removed, and by the holes for the bolts binding on the sole plates of the carriages. This, however, was not to be. During my temporary absence from the works, one of the men started to cut round the crown-plate, and another started at the manhole. Just as the manhole-plate was all slack, and the man at the crown-plate had cut about 15 in. by ½ in., a spark fired the gas. The men, having been cautioned, on seeing what had happened, reported the matter to me; and I, on arrival, found the crown of the holder on fire.

The flame being about 5 feet high, I ordered the manhole-plate to be put on; and calling for some wet sacks, applied them just as the flame was about an inch high and on the rise. The flame was burning fitfully—varying in height from one inch to five feet—as it burns when there is water in the pipe. On inspecting the sheet afterwards, I found it to be red hot. Now, what kept the holder from blowing up? I have always understood that a holder was comparatively safe until it had rested on the bottom, or until it ceased to give pressure; but that then, if fired, it would explode. There is one thing certain—gas will ignite by means of a spark from a chisel, pickaxe, or shovel. The plan usually adopted is to keep a little oil at hand, into which the workman's chisel is dipped from time to time. By this means, the spark is extinguished; and the only indication of it will be a hissing sound accompanied by a stream of smoke. Still, the question forces itself upon us—Why was there no explosion? I should have thought the conditions necessary for an explosion existed here; the pipes having been filled with water and the pulley carriages removed three or four days previously. But what I am thankful to say is that, although the gas was fired, there was no explosion. I can only account for it on the supposition that the holder was still more or less under pressure, which was perhaps slightly increased when a few men got on top of it. Then the heating of the plates would expand the gas, and thus maintain the pressure till I got it smothered.

On all flange joints on hydraulic main and stand pipes, I use mill-board painted, the flanges also being painted; and on all socket joints, as well as mouthpieces, I employ fire-clay and borings wetted with ammoniacal liquor. For all outside joints on mains under or over ground, I use Portland cement. Joints made in this way six years ago, are as good and tight to-day as could be desired. I have several connections made with Portland cement on street-mains for the past three or four years, which are also perfectly tight. I also use cement in the cavity of the driving main instead of lead.

I have several incandescent gas lights in use; and I must say they give the greatest satisfaction—at least, to the consumer, if not to the Gas Company, as they have reduced their bills considerably. Some of them have been in operation over twelve months, and there is no defect in the light; the mantle being in perfect order. As to breakages, the system of packing prevents this now. It seems to me that the Incandescent Gas-Light Company have left no cause for complaint on their part. As to street lighting, I have been trying some experiments; and will give the result at some future time. The trial tests were good, and much admired over the present system; but the heavy cartage over the service (in that particular district) was against the life of the mantle. I may here mention that we supply the consumers with Bray's burners free of charge, and that there is no meter-rental.

Now, as a "pound saved is a pound gained," let me take this opportunity of saying that, by attending such meetings as these, and joining in the discussions on important subjects, we may be prevented from rushing headlong into profitless expenditure; as by the simple precaution of taking advice from practical men who have had experience on those particular points, all this can be saved. This is not a time for reckless expenditure, but rather for practical improvements. There are none of us but like to experiment—in fact, it is part of our duty; but at the same time, it should be done with due consideration to the state of our exchequer. My experience of our members is, that they do not rush into every new thing that may be introduced; they prefer to take care to have the experience of older heads, or the practical results of those whose financial position enables them to give their brethren reliable advice as to its being wise for them to introduce it in their respective works. I should therefore recommend any requiring information to make use of these meetings for this purpose; and there is not a member but will be most anxious to give it.

Permit me to give just one illustration of those who think they know all themselves. Iron retorts were in use in a particular small works; and the manager, to improve things, was determined to substitute clay ones. The clay retorts arrived in due time, with loose ends. Now, as there were six inches left for expansion at the back end of the iron retorts, the allwise left the same space at the back of the clay ones. The ends were built in; and all looked well from the front of the bed. The stoker, having given the usual time, struck the lid and inserted the rake; but judge of his surprise when, shoving his rake to draw from the back end, he sent it through the retort—the loose end being driven back into the space so conveniently left for it, there to remain until it got cool before removal. The maker of these retorts was not well up in their manufacture according to that manager. Certainly either retort-maker or manager was not up to date—which I leave you to judge.

Just in such little matters will be found a great advantage to be derived from our Association. I know works where hundreds of pounds have been spent in improvements without any apparent benefit being derived from them. Had those parties realized the great advantage of our Association, they would not have made those stupid mistakes. Committees of gas undertakings might also consider that it would be money well spent to pay the expenses of their manager, so that he might be enrolled as a member and attend our meetings. They might rest assured there would be less outlay on experiments, and more on lasting and paying improvements.

As the majority of us are in charge of small works, it is important that every shilling should be well spent; and, as most of you here are practical men, doing your own work, you are the very men that possess the information we so much need. I feel that there is nothing grander than to know that you are both ready and willing to impart to us that knowledge that has taken you years to acquire, if we only ask for it. Members have themselves to blame, therefore, if they do not attend and receive the assistance we are all so willing to give and take.

I cannot close these few remarks without saying how much our Association is indebted to our worthy and painstaking Secretary, and how much he has done from time to time to make our meetings successful. How much pleasanter we could make it for him by volunteering papers early for next year, and not keeping him in doubt as to having material for debate until within a few weeks of the meeting. It is to be hoped that you will see the force of these remarks, and contribute something in due time, so that our meeting may be a most successful one under the presidency of Mr. Frizelle.

Mr. TULLY proposed a vote of thanks to the President for his able address. He must say he thought the President dealt with the gasholder which was on fire in a very courageous manner; and he certainly would not have liked to have been in the same position. He thought the men on the top were in a very awkward position.

Mr. C. B. OUTON (Dublin) seconded the vote. The remarks, he said, of their President had been very practical. Two or three of them struck him; and he thought he might mention them. One was in reference to the number of chimney stacks he recommended. He himself was making some slight alterations on his works; and he should certainly bear the subject in mind. It appeared to him that the employment of one large chimney—generally very much taller and out of proportion to the work which had to be performed—was much to be deprecated. The use of two or three chimneys—possibly one to every two or three benches—was much more to be desired; because, with a large chimney, the products of combustion of the bench that was farthest from the stack were checked by the products from the bench nearest to the stack, with the result that some variation was required in the position of the dampers. The employment of a greater number of chimneys also ensured greater uniformity in the adjustment of the dampers. He thought that Mr. Salmon was to be congratulated on the fact that the unfortunate accident to his gasholder occurred so soon after chipping commenced. If it had taken place somewhat later, it appeared to him that the gas and air would have had more time to diffuse, and possibly Mr. Salmon would not have been there that day to have delivered his address. He (Mr. Outon) was quite in accord with the President's remarks as to the utility of the Association. As a very young member, he could testify to the important fact that he had himself obtained most useful hints from attendance at the meetings; and he agreed that the membership should be enlarged as far as possible. He hoped that during the ensuing year they would have a great increase in the number of their members.

The motion having been heartily accorded,

The PRESIDENT said he was very gratified by the vote; but he might state that the things he referred to were really matters he had gone into. He found the greatest satisfaction from the small chimneys. He did not say that they would be adaptable in all cases. Perhaps where gas-works were very near houses, they would not be allowed. He might say that he was able to turn out 17 million cubic feet of gas a year by small chimneys in preference to large. With regard to the gasholder taking fire, he believed there was something they did not seem to have got right hold of yet, in the matter of explosions. He could not understand it himself. He was there; and he felt a little bit shaky, in putting on the bags he had referred to. He could not understand yet why the holder did not blow up. At one time he thought that the removal of the plate allowed air to get in lower down, and forced the gas to the crown. However, they could turn the matter over in their minds; and he would like to hear from some of the members at another time why the holder did not explode. He was pleased to say it did not.

Mr. W. A. REID (Longford) said that, some eight years ago, he was getting a new holder put in; and while the men were cutting out the crown, a spark fired the gas, and he was just in the same "boat" as the President. He, however, got a steam-pipe from his boiler, and played into it; and by this means, he put the fire out. The men, however, were so frightened that they all left him.

The PRESIDENT said he could not understand it yet. If there was a pressure by the men standing on the holder, that might account for it; but he did not think that their weight would materially increase the pressure.

Mr. OUTON suggested that an increase of pressure might be accounted for by the increase of temperature.

THE LUNCHEON.

The meeting was then adjourned for a short time; and the members were entertained by the Drogheda Gas Company to luncheon in the White Horse Hotel. Mr. Salmon occupied the chair, and was supported on the right hand by the Mayor of Drogheda—Mr. Bernard Nulty.

The PRESIDENT proposed the thanks of the Association to the Directors of the Gas Company for their kindness to them, and the HON. SECRETARY seconded the motion.

Mr. P. M'QUILLAN, one of the Directors of the Company, in acknowledging the vote, said that when they heard from their respected Manager, Mr. Martin, that the Association intended to hold their annual meeting in Drogheda, there was only one wish among them, and that was that the visit of the members would be a pleasant and enjoyable one.

The MAYOR thanked the Directors for the honour which had been done him in asking him to be present. The local Gas Company, he knew, was ably and efficiently managed by the Directors, and he knew also that they had a most competent Manager in Mr. Martin. Complaints were sometimes made regarding the Company; but during the two years he had held an official position in the town, he knew that, whenever complaints were made, they were always attended to.

THE NAME OF THE ASSOCIATION.

Mr. WALSH (on reassembling) asked if he would be in order to move—"That the Standing Orders be suspended," so that he might move a resolution.

Mr. WILLIAMSON said they had no Standing Orders. They had rules to guide them; and he hoped they would abide by them.

The HON. SECRETARY asked Mr. Walsh to at once propose his resolution.

Mr. WALSH thereupon proposed that the title "North of Ireland Association of Gas Managers" be changed to "The Irish Association of Gas Managers."

Mr. WILLIAMSON proposed that they proceed with the next business. Perhaps Mr. Walsh was not aware that a few years ago a good deal of trouble and expense was incurred in sending a circular round, he thought, all Ireland, for the purpose of getting an assembly of gas managers at the next meeting, to see if they had any resolution to propose to change it; and he understood that the result was that one would have joined and two would have left, if the Association had been changed at the time. Some of those addressed did not think it even worth their while to reply to the circular. Surely, then, it would hardly be fair, after all this trouble had been taken, that the name of the Association should be changed so suddenly. Of course, personally, he had no objection, if the matter were done constitutionally.

The PRESIDENT said he could bear out Mr. Williamson to the letter. He believed that only two managers in his direction answered the circular, although it was, he believed, issued to every gas manager in Ireland.

Mr. WALSH said he did not get one.

The HON. SECRETARY said he sent the circular to all the managers whose names he could find in any directory. There was a section in their rules which said: "Any proposition for adding to or altering the regulations, shall be laid before the Committee, who may bring it before the Association if they think fit; being bound to do so should it be accompanied by a requisition from any five members of the Association." So that, he thought, the constitutional way for Mr. Walsh to proceed was to get up a requisition, signed by five members, and send it to him (the Secretary), and it would be laid before the Committee, and would come before the members at the next annual meeting.

Mr. WALSH hoped they would excuse him for bringing the subject forward.

The PRESIDENT said it was only what every member should do—to express his opinion.

Mr. WALSH hoped that no objection would be taken to what he had said.

The PRESIDENT: Oh, certainly not; in 1886 I raised the same question myself.

The subject then dropped.

A PAPER WITHDRAWN.

The HON. SECRETARY said that Mr. Stears had seen fit to withdraw his paper, entitled "Experience of Four Months' Working with Hislop's Regenerative Furnaces at the Lisburn Gas-Works;" which was the first paper on their list. Mr. Stears wrote: "With four months' experience with Hislop's retorts, it seemed premature to go into their working until I had some alterations made on the main flue of our chimney, which is some distance from our retort-house. This I shall not be able to do until later in the autumn." For this reason, he asked to be allowed to withdraw his paper.

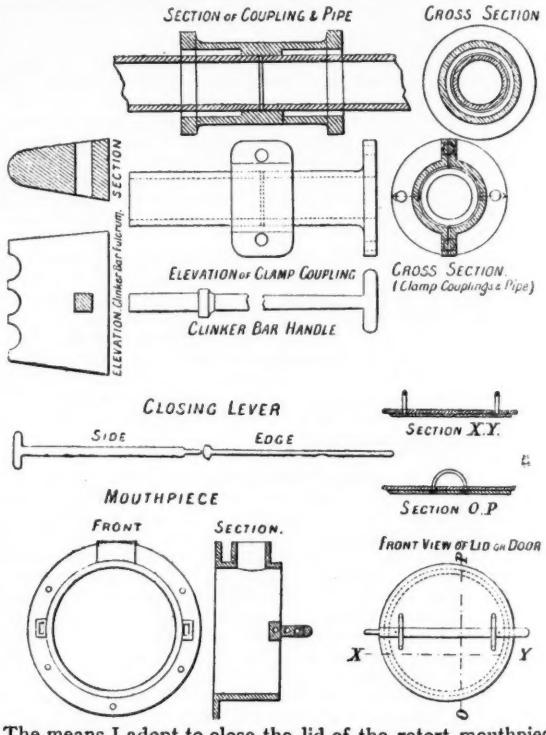
READING OF PAPERS.

Mr. M. MARTIN (Drogheda) read the following paper on

SUCCESSFUL METHODS OF DOING ORDINARY WORK IN GAS-WORKS.

I have been requested to prepare a paper for this meeting; and the title I have selected is the above. It is my intention to make it as brief as possible.

The first part of the paper will be in connection with the furnace—in order to assist the stokers in removing the clinker from the sides and back of the furnace, with the ordinary clinker-bar. I thought a good many years ago that fulcrums of different heights, with a long handle attached to them for the clinker-bar to rest on, would assist and expedite the work; so I adopted them, and, of course, found them to be a great improvement on the old system. This is a small model of both bar and fulcrum. The furnace is 10 inches wide at the bottom, and increases in width as it goes up to support the arches, which, where they spring, are 20 inches wide. The length of the bars is 3 ft. 6 in.; and two of them are in each furnace. The weight of each bar is about 90 lbs.; and they stand fully eighteen months, with a perfectly white heat all the time. This [exhibiting a model] is a perfect model of the oven and settings. I have made 120,000 cubic feet of gas in 24 hours with four of these ovens, five in each setting.



The means I adopt to close the lid of the retort mouthpiece consists of a double lever. The door is made to act as the first lever; and the second one is the principal one for effectually closing the door. The sockets are cast on each side of the mouthpiece. Into each of these are inserted short pieces of angle iron; and in the left-hand one, is a ¾-inch hole, about an inch from the face of the mouthpiece. On the door on the same side is riveted a flat strip of iron, the end of which projects, and is rounded to fit in the above hole; and this acts as a fulcrum for the door as the first lever. Then, again, the right-hand one has a hole in it, in a similar position to the other. This hole acts as a fulcrum for the main lever; and it extends right across the door, and nearly 12 inches over it. In the flat of the left-hand angle piece, are several ⅜-inch holes, in zig-zag form; the lever being kept in position by dropping a round tapered pin into these holes. Road scrapings are used for the luting of the door. These are delivered almost free in the works, and are almost entirely composed of pulverized limestone.

My means for jointing the ascension-pipes, &c., does away with flange and faucets; and the joint can be made in a quarter the time required for the others. It consists of a pair of clamps to each joint, held in their place by two ⅝-inch bolts, when properly fitted to the outside of the pipe. The jointing material may consist of any suitable substances—such as white and red lead, mixed as a putty, and, of course, fixed on the inside of the clamps, and screwed up firmly with the two bolts, when the joint is finished. Great advantage is gained in taking the pipes down for renewal. Remove the two bolts, and all comes away in a very short time, compared with the old jointing system.

In conclusion, I would refer to a new cast-iron coupling for street mains, &c. It forms a double faucet on each end of the coupling; and is made the same diameter and depth as the faucet of the pipe it is intended for. Midway in the interior, is cast a rib, about two inches broad; and the diameter

of this rib is made so as to pass freely over the outside of the pipes when placed in position. This rib is equally divided over the ends of each pipe, and keeps them in proper position. The rope yarn or packing cannot get over the ends of the pipes. This, I think, is an improvement on the old plain style of coupling.

Discussion.

The PRESIDENT said they were certainly much indebted to Mr. Martin for his very instructive paper. Though the models looked simple, they were very ingenious. If bridge-pipes or stand-pipes became stopped, a man had to stand on the top, and bear all the fumes that came out. He was himself about to make an application of something similar to Mr. Martin's; but that gentleman had a better idea. His own notion was to have an opening about 3 feet from the mouthpiece, and to have a self-sealing door upon it. So it was apparent that Mr. Martin and he had had some trouble with stopped pipes. Then, in the sleeve or collar which Mr. Martin used, it was impossible for the yarn to get into the main. He thought it was a very good way of making sleeves on mains.

Mr. T. T. LLEWELLYN (Newbridge) said he should like to ask one question with reference to ascension-pipes. Sometimes they had a difficulty in making a joint gas-tight in an ascension-pipe, owing to the expansion of the pipes with the variation of the heat; and he wished to ask if Mr. Martin found white and red lead sufficient to make a joint securely.

Mr. W. MILLER (Cookstown) asked, with reference to the same appliance, if Mr. Martin did not at times find the need of putting something ilke a leather in at the lugs. He needed a stopper at the corner where the two united; and he found it was of immense advantage to put in something to grip both sides while they pushed in, so as to make the opening circular all round. As to the help to clinkering, he thought the idea very good indeed, as they occasionally found that the men did injury in their endeavour to get the clinker outside the furnace.

Mr. T. FRIZELLE (Holywood) asked if Mr. Martin's furnace-bars were of cast or malleable iron.

Mr. MARTIN: Cast iron.

Mr. FRIZELLE inquired if he found them to be as good as malleable iron. He had found, in using cast-iron bars, that the heads broke off with the leverage of the clinker-bar. But perhaps his bars were not so heavy as Mr. Martin's. He had taken to 2-inch square malleable iron bars, which went right through to the bed-plate; and he found them a great improvement, for the reason that they could be shook up and the clinker picked off, especially if they were working with a coal yielding a lot of clinker, which required much picking off.

Mr. MILLER took it for granted that, whether the bars were of cast or malleable iron, they nearly all came through to the bed-plate.

Mr. C. B. OUTON (Dublin) considered the members were much indebted to Mr. Martin for his paper, as he had given them a few very good hints. It appeared to him (Mr. Outon) that the chief use of the bearing-bar, besides constituting the fulcrum, was to distribute the pressure over the two bars in use; and for this reason there was less liability of the bars bending when malleable iron was used. He did not quite fancy the position of the joint mentioned by Mr. Martin. It occurred to him that in the case of idle retorts, with the mouthpieces removed, and the retorts about to be renewed, the ascension-pipes, if left in position, would cause an undue strain on the dip-pipes—all the weight being on the one side. He thought the collar or sleeve was a wonderful improvement. It was what they should all adopt as soon as possible. The two pieces, when joined, came exactly together; and it occurred to him that on no account could the yarn get inside the pipe. He was very pleased with it; and he should trv to adopt it as soon as possible.

Mr. G. R. LOVE (Dundalk) asked if it added much to the cost of the sleeve to have the part put into the interior of it. As they were all aware, they had these sleeves to buy, of standard sizes, from ordinary makers; and the question he should like to put was what the extra cost of the inside piece would be. Another very important item was that great care would have to be taken in putting on the sleeve. It was just possible that it might be put on too far either way; or in cutting the pipe they might fracture it, so that this might add to the cost. It was possible, again, that in putting in the yarn it might be all driven on the one side. These were things they could not get workmen to do aright, unless they looked after them. With reference to the joint on the ascension-pipe, he did not know that it would be decidedly to their advantage to adopt it, because, owing to the exhauster stopping, or anything of that kind, they might have considerable difficulty with the joint leaking. As to doing away with the faucit, he found it better to have a large faucit, to allow for the expansion and contraction of the bench. They were, he thought, much indebted to Mr. Martin for his paper. He had stated his own personal observations from a very practical standpoint, and had set them a good example in giving them his paper.

Mr. MILLER said he should like to ask Mr. Martin if he did not mean his arrangement also to apply to a split collar. They sometimes found there was just a hair-line which allowed the gas to escape; and it was possible to put on a collar to stop it. It would be a good idea to have the thing in two halves; he thought it would work very well.

Mr. WHIMSTER said he should like to add a word or two before Mr. Martin replied. He must say he was highly pleased with the paper, and thought it was just such papers as these that they wanted at Gas Association meetings. It had been a short paper; but, with the models and the drawings, he believed it would be a very valuable one to working managers—to those who had to look after these things themselves, and who had not foremen or sub-managers to do it for them. The various things Mr. Martin had brought forward were particularly useful. It struck him (Mr. Whimster) that the clinker-bar fulcrum was an excellent thing. He had often noticed, when his men were cleaning the furnaces, how awkward a job it was to remove the clinker from the back on to the bed-plate. An appliance like the one before them removed the difficulty at once. It enabled the work to be done quite easily; and the pressure was put upon both of the bars, and not on one place. It was an appliance they could all adopt quite easily. As to the question Mr. Frizelle had put regarding cast and wrought iron bars, he might say that he had thrown out the cast-iron, and gone in for the wrought-iron bars. The difficulty with cast iron was that they always had to leave a certain space for expansion, and this space became filled up with dust, or clinker, or something of the kind; and the result was that the front was pushed out. With the wrought-iron bar, he had no trouble. It came out below the bed-plate, and it could expand or contract as much as it liked; it gave nobody any trouble. He thought the arrangement for fixing on the retort-lid without luting was a very good one. It looked rather complicated; but it really was very simple. He was glad Mr. Martin had brought it before them; it showed his ingenuity in doing things for himself. He thought there must be a very good and tight mouthpiece with such a joint. With reference to the jointing of the ascension-pipes, it struck him as being a very useful and a very simple arrangement—not that he would use it in the way Mr. Martin did. He would not think of putting a simple spigot-end on the mouthpiece, but would stick to the socket on the mouthpiece, which would permit them to make allowance for variations in the length of the setting. Sometimes there was a question of cutting a whole pipe to get a faucit-end to go in. This appliance would just do for such a case. Some members had questioned whether the sleeve joint was sufficient. He could testify that it was, because he had used that very joint for covering blow-holes in pipes, and there was no difficulty with it whatever. Two pieces like that on an ascension-pipe would be quite sufficient. With reference to the thimble, he thought it was a splendid thing; but he saw another advantage in it, which had not been mentioned. Not only was it a preventive of the yarn getting into the pipe, but it kept the sleeve perfectly fair on the pipe; and there was an equal joint all round, without having to begin sticking in chisels and the like to get the pipes true before they ran in the lead. So far as the cost was concerned, he did not think it could come to very much; but even if it did, he thought they could afford it, because of the comfort it would be. He was much indebted to Mr. Martin for his paper.

Mr. R. Ross (Dungannon) said the lever was certainly a very good thing; but how would they do when the men pulled out the bars altogether, and laid them on the floor? There were different ways of clinkering. Some left the bars in, and others took them out; and they would find, in many large works, that the bars were pulled out entirely.

The PRESIDENT said he agreed with Mr. Ross. They generally pulled out the bars to remove the clinker from them; and when they were removed, the men could get on much better. He had only one doubt with regard to the joint; that was as to the material of which it was made. He had tried red and white lead, and when heat was applied to them he found that they "walked away;" and then there was an outcry about the tar, or something else, running down. But there was a material employed for covering boilers which, he thought, might be used. However, Mr. Martin, after he had practised with his joint, would be able to tell them about it. With reference to split collars, he had many of them; and the difficulty was to make the joint right where the split was. He therefore considered it better to make them in one piece.

Mr. MILLER thought he was perhaps the "father," in that meeting, of the idea of split collars, and he found no difficulty in joining the two halves on the main, and making the perfectly tight joint.

Mr. MARTIN, in closing the discussion, said there were two bars in his furnaces; and his appliance was slipped in on the top of the bars, which were never removed at all. They were cast-iron bars, of considerable weight; and they stood for about eighteen months. With regard to ashes getting down at the ends of the bars, there was about an inch space left for expansion and contraction; and if they gave the thing a shake, the whole of the matter which gathered there fell down, and caused no one any trouble. With respect to joints of red or white lead, he might say he had had them in operation for the last two years on the ascension-pipes, and they had never given way. It was a very light joint—not a 20 lb. or 30 lb. one; and they were more easily taken down than when there was a faucit. With the sleeve joint, the interior sleeve was made so that it slid in; and they could make a chalk mark to keep it in position.

Mr. LOVE: Do I understand that you keep patterns of every size of your collars?

Mr. MARTIN: Yes.

Mr. C. B. TULLY (Sligo) read the following paper:

THE ADVANTAGES OF A PROVISIONAL ORDER FOR GAS COMPANIES.

Notwithstanding the growth and spread of electricity as applied to illuminating purposes, its relative cheapness as compared with former rates, its facility of distribution, and its general utility, gas still continues to be the usual and popular means of light production, and to be utilized more extensively for cooking, heating, and motive power. Recent electrical discoveries have not appreciably affected the continued increase in the consumption of gas in these countries; nor have recent electrical discoveries to any extent lessened the profits of gas undertakings when properly controlled and managed. It is now an admitted fact that, even if electricity does further encroach upon the domain of gas for lighting, gas will more than hold its own in the competition, by the certain increase of its use for cooking, and the slot meter.

From the last returns presented to Parliament, the extent of the growth and the importance of gas undertakings are apparent. No less than £68,000,000 is now invested in them; and every year sees a further addition to this enormous capital. There are, according to this same source of information, 428 gas companies possessing authority to carry on the work; and these have a capital of £44,036,225. They have a total length of 14,345 miles of mains. There are 192 local authorities in the United Kingdom who have procured statutory powers for supplying their several districts themselves; and they have a capital of £23,619,082, and a total length of 8481 miles of mains.

A comparison of the statistics of growth for the period from 1883 to 1892, will show a vast increase in gas undertakings, although that occurs side by side with an unexampled development of electricity for illuminating purposes. Thus in 1883, there were 357 companies with an authorized share and loan capital of £48,000,000; while in 1893, there were 428, with a share and loan capital of £55,000,000. In 1883, there were 148 local authorities supplying gas, with an authorized capital of £21,000,000; and in 1893, there were 192 local authorities, with a capital of £27,240,458. This table shows a marked and marvellous growth in enterprise; and it is one of the most encouraging features of the industry.

In England and Scotland the advantages and utility of the systems and safeguards of a Provisional Order are being widely appreciated and adopted; and as the powers and privileges of a company so constituted are many and manifest, in comparison with its condition otherwise, I shall in a few words endeavour to explain the altered and bettered position of a company so regulated. In Ireland, this information may be particularly useful, as but in a very few instances have the benefits of a Provisional Order been sought; and it would therefore be well for the existing Irish companies to understand what they are losing by not adopting the system. In Sligo we have obtained a Provisional Order; and we find from the experiment of its successful and satisfactory working, the advantages of the course as contrasted with our position before and under our Private Act. Our contrasted position can be easily described, and will be readily understood by those acquainted with the working of gas companies.

The Provisional Order is to all intents and purposes an Act of Parliament, with the validity and rigour of a statute. Under Provisional Orders, companies obtain powers to construct or extend their works, and secure by implication a regulated monopoly. As long as companies fulfil their obligations within their Order, they acquire the sole right of gas supply in the district; and Parliament will not authorize any company or local authority to compete with them. This fixity of tenure and freedom from disturbance or competition is a great boon, of which it is impossible to exaggerate the importance, and which, if it stood alone, would be well worth the cost ten times over of obtaining the Order.

It was with a view to facilitate the obtaining of parliamentary powers for the supply of gas or water, that the Gas and Water Works Facilities Acts of 1870 and 1873 were passed. Under these salutary statutes, I will explain what can be done, and what powers can be obtained. By the fourth section, Provisional Orders authorizing any gas undertakings may be obtained in any district by any company, companies, or person. They may be obtained for: (1) The construction, maintenance, or continuance of gas-works, and the manufacture and supply of gas in any district where there is not an existing company, corporation, body of commissioners, or person empowered by Act of Parliament to construct such works, or to manufacture and supply gas. (2) The raising of additional capital for any of these purposes. (3) Enabling two or more companies or persons duly authorized to supply gas in any district or in adjoining districts to enter into agreements jointly to furnish such supply, or to amalgamate their undertakings. (4) Authorizing two or more companies or persons supplying gas in any district, or in adjoining districts, to manufacture and supply gas and to enter into agreements jointly to furnish such supply, and to amalgamate their undertakings. Under the Public Health Act (England) 1875, section 161, and by the Act of 1878, Urban Authorities are given powers to contract for public lighting, and to supply gas for public and private purposes, where there is not any company already authorized existing since the Act came in force; and up to 1893, there had been received by the Board of Trade 403 applications for Gas and Water Orders, of which 378 had been granted, and 372 confirmed by Parliament.

From the same report, it appears that in three of the Gas Orders made in that year by the Board of Trade, the sliding-scale of price and dividend was adopted; the initial price per 1000 cubic feet being fixed in the respective Orders as follows: Portishead, 4s. 6d.; Sligo, 5s.; and Swindon, 4s. 3d. In four Orders, a maximum price per 1000 cubic feet was fixed as follows: Bromyard, 5s. 10d.; Llanfairfechan and Aber, 5s. 10d.; Newent, 5s. 10d.; and Portishead, 5s. 3d. The supply of gas in bulk beyond the limits of supply, subject to the usual limitations, was authorized in the Llanfairfechan and Aber, Otley, Sligo, and Swindon Orders. In the first of these, the promoter being an individual, a provision was inserted that no sale or assignment of the undertaking should have effect until approved of by the Board of Trade. The form of the Orders varies according to the purposes desired to be effected. Except as regards applications made under their power by urban authorities, Provisional Orders under these Acts are made by the Board of Trade.

The procedure for obtaining a Provisional Order is simple and inexpensive. Notices have to be given and published, and the Order is of no effect until confirmed by Parliament. As regards opposition to these measures, they may be opposed in Parliament in the same way as ordinary Private Bills; but usually the opposition is dealt with by the Board of Trade while the Order is under the consideration of that department. It is usual to incorporate in the Orders the Gas-Works Clauses Acts of 1847 and 1871.

Unless a company are acting under the powers conferred upon them by Provisional Order, or are constituted under a Special Act of Parliament giving them these powers, they work with very many disadvantages and drawbacks. Breaking up, without parliamentary authority, public streets, roads, pavements, or footways, in order to lay down, repair, or replace gas or water pipes, is a nuisance at common law, and may be made the subject of an indictment.

The theory of the sliding-scale is to give the consumer a pecuniary interest in the economy and skill of the gas company, so that if by these means the company are enabled to make and supply gas at a lower price, they shall, on the one hand, make a reduction in the price of gas to the consumer, and, on the other hand, be able to pay their shareholders a proportionate increase in the otherwise authorized rate of dividend. And again, if they made any increase in the standard price, they must make a proportionate decrease in the standard rate of dividend. In its working, the result of the operation of the sliding-scale has been beneficial to the public, and has led to the lowering of the price of gas, and to increased dividends.

Another provision introduced into all Provisional Orders is what is called the auction clause. By a Standing Order of Parliament, it is provided (188a) that "in every Bill by which an existing gas or water company is authorized to raise additional capital, provision shall be made for the offer of such capital by public auction or tender, at the best price that can be obtained, unless the Committee on the Bill shall report that such provision ought not to be required, with the reasons on which their opinion is founded." The effect of the auction clause in working has been described as being most beneficial. It adds to the capital of the company so much money as is obtained by way of premiums on the nominal or face value of new shares. This sum so added to capital bears no dividend; and inasmuch as it necessarily helps to earn profits, it thereby increases the amount of profits divisible among the holders of the dividend-bearing capital, and helps to decrease the price of gas to the consumers.

The extent of the working of the auction clauses may be shown best by an examination of the statistics supplied to Parliament in 1893. In 1883 the amount of authorized gas capital subject to the auction clause was £9,339,760; and in 1893, it was £13,217,555. The amount of such capital sold by auction or tender was, in 1883, £2,538,709; and in 1893, it was raised to £5,417,667. The amount of premiums realized by sales of shares under the auction clauses in 1883 was £1,088,675; and in 1893, it was £2,432,970.

It is difficult to exaggerate the importance and advantages of these two. The sliding-scale fixes a standard price; and it has been found in operation a two-fold benefit. It popularizes the undertaking by giving the consuming public an interest in its prosperity; and it adds immensely to the stability of the company.

The old reserve fund, where the sliding-scale is introduced, is supplanted by an insurance fund and a new reserve fund. The insurance fund is in itself also an admirable idea. It is thus regulated and carried out: When the clear profits in any one year amount to a larger sum than is required to pay the dividend on the preference capital (if any), and a dividend on the ordinary capital at the standard authorized under the sliding-scale—which cannot exceed 10 per cent.—the excess beyond the sum necessary for these purposes may from time to time, to the extent of 1 per cent. upon the paid-up capital of the company, be invested, and then allowed to accumulate at compound interest to a sum equal to one-twentieth of the paid-up capital. This forms the basis of the insurance fund; and out of this a company can, without burdening themselves with new liabilities

or increasing their capital, meet any extraordinary demands upon their resources. They can meet the emergency of a strike or accident.

The West Ham Gas Act of 1893 is in these respects a model and a precedent. After providing for the sliding-scale and insurance fund in the usual way, it goes on to provide that, whenever such excess shall exceed the sum necessary to provide for the reduction of 1d. per 1000 cubic feet in the price of gas sold in the preceding half year, as shown by the accounts of the Company, and for the increased dividend which the Company would be authorized to pay in respect of such reduction of price, they shall reduce the price to be charged for gas in the next half year by 1d. per 1000 cubic feet.

A further advantage offered by the statutory powers of a Provisional Order is the security it offers to investors, as compared with the ordinary arrangement. This security has made undertakings so financed most popular investments. It also gives facilities for raising the additional capital necessary for extensions of business, enlargement of premises, or such like extraordinary works. This can be, under the Order, raised at about 4 per cent.; and, by this comparatively cheap way of financing, a great benefit will be derived by both shareholders and consumers.

The advantages of a Provisional Order to gas companies operating without statutable powers are so manifest that it is impossible to conceive how, in these days of competition and enterprise, any gas undertaking can be efficiently carried out in the absence of these now necessary powers. From the experience of its working everywhere it has been tried, the Provisional Order has been a source of profit and advantage to the company adopting it, and a means of strengthening and popularizing the company availing themselves of its salutary provisions.

The cost of a Provisional Order depends upon the amount of opposition it receives; but it can be roughly estimated at about £150. I hope in a very short time the present Government will see its way to bring in a Bill to enable us to carry out the work in Dublin, which would very much reduce the expense.

Discussion.

The PRESIDENT said there was no doubt that a great many of them would require to prepare themselves for getting statutory powers. If what Mr. Tully suggested were adopted, he thought it would give them greater foothold in their several towns than they had at the present time.

Mr. G. R. LOVE (Dundalk) said he had listened with great interest to the most instructive paper by Mr. Tully. He was sure they were all very much indebted to the author for bringing it forward. He thought that those members who were with non-statutory companies should bring the matter before their directors; and he was sure they would all read the paper with a great deal of interest. It would show them their exact position, and the advantages to be gained by being statutory companies. He might state that the Company he worked under had an Act of Parliament; and, though he could not give them so much information as Mr. Tully had, he would like to draw their attention to the matter of cost. Mr. Tully mentioned £150. Well, his Company spent upwards of £5000 in getting their Act, which, however, was quite a different thing from a Provisional Order. But an Act was a far more complicated matter to carry through than a Provisional Order.

Mr. TULLY said they had experienced some opposition in Sligo; but he thought any way Mr. Love might have got his Act cheaper, if he had tried. A Provisional Order was quite as good when confirmed as an Act of Parliament. The only difference was that they could not get power for the compulsory purchase of land under a Provisional Order. They could get any other power, under a Provisional Order, except for compulsory purchase of land, or the like, for gas-works. He thought, however, they should try to get such matters arranged in Dublin; for he did not at all see (quite apart from politics) why they should be obliged to go to London and get them arranged there.

Mr. WILLIAMSON said he would prefer a little nearer home even than Mr. Tully suggested; and would say that each County Council should have the power to deal with these matters. He was not for going to Dublin at all.

Mr. LOVE suggested that, to get the advice of experts and lawyers, would cost as much to them as did going to London.

Mr. TULLY thanked the members for their reception of his paper.

Professor W. IVISON MACADAM, of Edinburgh, delivered the following lecture, illustrated by lime-light views:—

ON THE ILLUMINATING VALUE OF THE VARIOUS CONSTITUENTS OF COAL AND OIL GAS, AND THE CONDITIONS NECESSARY TO PRODUCE INCANDESCENCE.

The subject which I have chosen for my lecture to you is one which is at the present time receiving very considerable attention; and the theories advanced are so widely different, that it becomes a matter of difficulty to follow the many workers.

The substances present in illuminating gas, whether made from coal or oil, may roughly be said to be methane or marsh gas, unsaturated hydrocarbons of the olefiant gas type, a small proportion of benzol-type bodies, the two oxides of carbon (carbonic anhydride or carbonic acid and carbon monoxide), hydrogen, oxygen, and nitrogen, &c. Of these bodies, nitrogen and carbonic anhydride are not combustible; carbon monoxide and hydrogen give non-luminous flames; and the remaining substances are combustible, yielding more or less luminous flames. The proportion in which these substances are present varies greatly. The unsaturated hydrocarbons, for instance, may be present in oil gas to the extent of from 20 to 40 per cent.; while in coal gas the proportion may fall as low as 5 to 10 per cent., or in some few cases run up to 15 or 18 per cent.

As illustrating the composition of coal gas, I may quote an analysis given in the JOURNAL OF GAS LIGHTING for Jan. 8 last (p. 72). It is as follows:—

London Gas (Thwaite).

	Per Cent.
Unsaturated hydrocarbons	3·84
Benzol	1·04
Marsh gas	35·63
Carbonic anhydride	1·41
Carbon monoxide	6·15
Hydrogen	47·73
Oxygen	0·30
Nitrogen	3·90
	100·00

This gas would probably run about 12-candle power for each 5 cubic feet. Of course, these figures vary greatly with the coal employed in its manufacture, as will be seen from the following analysis of London gas of 12 and 20 candle power:—

*London Gas.**

	12-Candle Power.		20-Candle Power.
Unsaturated hydrocarbons, &c.	3·8	..	13·0
Marsh gas	39·5	..	50·0
Carbonic anhydride	0·6	..	0·1
Carbon monoxide	7·5	..	6·8
Hydrogen	46·0	..	27·7
Oxygen	0·1	..	0·0
Nitrogen	0·5	..	0·4
Moisture	2·0	..	2·0
	100·0		100·0

The temperature at which the coal has been retorted also alters the composition as well as the yield of the gas. This is shown in the following table, given in "Thorpe's Dictionary of Applied Chemistry":—

Newcastle Coal.

Gas per ton of coal, cubic feet	8250 ..	9692 ..	12,006
Illuminating power, candles	20·59 ..	17·80 ..	15·60
	Per Cent.	Per Cent.	Per Cent.
Unsaturated hydrocarbons	7·55 ..	5·83 ..	4·51
Marsh gas	42·72 ..	34·50 ..	30·70
Carbon monoxide	8·72 ..	13·50 ..	13·96
Hydrogen	38·09 ..	43·77 ..	48·02
Nitrogen	2·92 ..	2·40 ..	2·81

These results are perhaps better understood when they are calculated to the cubic feet of each gas produced per ton of coal. They are—

Unsaturated hydrocarbons	622·9 ..	565·1 ..	541·5
Marsh gas	3524·4 ..	3344·1 ..	3685·8
Carbon monoxide	719·4 ..	1211·6 ..	1676·0
Hydrogen	3142·4 ..	4242·6 ..	5765·3
Nitrogen	240·9 ..	329·6 ..	337·4

Lewes† gives the following lighting value of various carbon and hydrogen compounds per 5 cubic feet burned:—

Marsh gas	5·2 candle power
Ethane	35·7 "
Propane	56·7 "
Olefine	70·0 "
Propene	123·0 "
Acetylene	240·0 "

These results, while comparative, are not those obtained in every case, but will vary with the apparatus employed as a burner. Thus, 5 cubic feet of the same gas have yielded me from 25-candle power to 61·95-candle power.

The pressure at which the gas is passed to the burner is one of the most important factors in deciding the illuminating value obtained from the gas. Thus, 5 cubic feet of a gas gave me, when burned at 18-10ths pressure, only 11·14-candle power; while the same gas, from the same burner, at 5-10ths pressure, gave 20-candle power. The effect of pressure has long been recognized by burner manufacturers; and it has been very fully worked up by Mr. Hislop, of Paisley, and others. The various devices employed to this end are well known. They consist of double burners, end to end, choked by gauze discs; and, best of all, by means of regulators attached to each burner. The older double burners were not choked; and the two burners were generally of the same bore. Now the burners are both choked; and the lower burner is very much smaller in bore than the upper. This device lowers the pressure at the point of ignition, and greatly increases the luminous value of the gas. Of the regulator burners, the best I know are those made by Messrs. Peebles and Co., of Edinburgh. They are necessarily dearer than the simple varieties; but the regularity of consumption and light value fully repays the increased cost.

When we desire to consider the changes which occur in the composition of the gas during combustion, we enter a more

* "Chemistry as Applied to the Arts and Manufactures," Mackenzie.

† See JOURNAL, Vol. LXV., p. 169.

difficult field. The light obtained may be due to substances contained in the gas itself, or it may be due to a foreign body introduced into the flame. In this last case, the gas is mixed with air before combustion, so as to produce a non-luminous flame; and this is then allowed to impinge on the body to be rendered incandescent, while certain substances which, when burned under ordinary conditions, yield non-luminous or nearly non-luminous flames, may be made to give luminous flames by subjecting them to pressure. It is generally accepted that luminosity is usually due to the presence of solid particles in the flames, which, when heated, give off light. Professor Frankland has, however, shown that it is possible to obtain light from heated dense hydrocarbons; but we shall wait for further experimental proof before accepting the theory that the luminosity of coal gas is due to this cause.

The general explanation given in text-books as to the changes taking place in an ordinary flame is that there are three distinct zones—the first or inner zone, largely caused by the pressure of the issuing gas, and consisting of unburned gas; the second, or luminous zone, in which the hydrogen is burned into water, and the heat developed during this change rendering the carbon incandescent; and the last, or outer zone, one in which the carbon is converted into carbonic anhydride. As no solid is present in this zone, it is non-luminous. This explanation has a great advantage—it is simple; unfortunately, it is also grossly inaccurate. The Bunsen jet is explained as being similar to the ordinary jet, except that the luminous zone is wanting.

Professor Smithells, of Leeds, who has done good work on this subject, has at the same time shown that these explanations are wrong, and that they are not even warranted when considered alongside of Sir Humphry Davy's original statement. Smithells started his experiments by watching the gradual development of a flame obtained from a very small amount of combustible. The small flame thus obtained is practically non-luminous, and consists of a hollow, bright blue cone surrounded by a lilac coloured border. When more gas is turned on, a luminous spot is formed, which, as the quantity of gas is increased, becomes more and more developed. The original inner cone now forms a small fraction of the whole flame, and constitutes the blue region.

If, instead of starting with a non-luminous flame, we commence with a luminous jet, and gradually admit air, the same series of changes are noticed; but, of course, in the reverse order. From these experiments, Smithells concludes that there is no essential difference between an ordinary luminous and the non-luminous flame—that the non-luminous flame may be considered as a gas-air flame with the blue and non-luminous regions at a maximum, and the yellow luminous regions at a minimum; while the luminous flame is to be regarded as a gas-air flame with the blue and non-luminous parts at a minimum, and the yellow luminous region at a maximum.

When air in excess is passed into the Bunsen flame, it "strikes back." Smithells has devised an instrument to show this process, and to demonstrate what actually happens. When the tube of the Bunsen is lengthened by means of a glass tube, and the excess of air is gradually admitted, it is noticed that the process of "striking back" takes place in two stages. First, the inner cone passes down the tube; then the outer portion. When working with a plain tube, it is difficult to regulate the process so as to arrange that the two cones will be retained in the tube for a lengthened period. By introducing a glass rod into the centre of the glass tube, however, the upward current of gas is retarded, with the result that, when air is admitted in excess, the inner cone is stopped at the apex of the rod. A still better method consists in making a constriction in the tube, or by the use of two tubes one inside the other. By the last method, especially, the flame can most readily be split into two, and the products of combustion of the two parts can be separately obtained for analysis. By these means, Smithells has shown that the blue region is one of incomplete combustion, in which carbon monoxide, carbonic anhydride, hydrogen, and water are the chief substances produced; while in the outer part, the hydrogen and carbon monoxide are burned to carbonic anhydride and water. His experiments, therefore, show that carbon is first oxidized and the hydrogen set free, to be afterwards consumed in the outer envelope. This is, therefore, directly opposite to what was held in the older theory.

Lewes, who, as you know, has done much work on this subject, holds that the hydrogen diffuses to the outer part, and is there burned. The methane also diffuses, though more slowly, and is consumed in the outer part. The combustion of these bodies raises the temperature of the flame to 500° C., and gradually upwards to 1000° C. At this temperature, the olefines are converted into acetylene and hydrogen. If the temperature does not rise above 1000° C., the acetylene polymerizes into benzol; but should the heat rise to 1200° C., it is split up into carbon and hydrogen. The combustion of the hydrogen then raises the carbon to a state of incandescence, and produces the light. The difficulty of accepting this theory lies in the fact that neither Lewes nor Smithells, nor any other worker so far as I know, has been able to demonstrate the presence of more than a trace of acetylene in the products of the inner zone. Acetylene is a colourless gas with a decidedly garlic odour, and burns with a very smoky and highly luminous flame. It is produced in large quantities when carbide of calcium is placed in water. The carbide is formed when chalk or lime, mixed with carbon, is fused in an electric furnace. There is no difficulty in producing the substance; and, if a demand for the body sprang up, doubtless it could be readily produced at a moderate cost. The plant to manufacture acetylene from the carbide need not be costly; and the process is simplicity itself. Unfortunately, however, the gas is practically useless as an enricher; and this fact alone is sufficient to condemn the process for large works. For smaller services, as in country houses, or for railway purposes, it may yet be found useful.

Various attempts have, from time to time, been made to introduce into the outer zone of the ordinary flame solid bodies which might be raised to a state of incandescence, and so utilize this non-luminous area. Scholl's platinum plate was a step in this direction. None of the patents have, however, been successful so far. In 1868, Hogg, of Edinburgh, took out provisional protection for a process to render platinum cones incandescent. He, however, did not carry out his patent; and it was reserved to the Welsbach Company to bring the idea to a successful issue. They work with a burner which is essentially a Bunsen burner, into which a slight excess of air is drawn. The openings by which the gas passes into the tube are very small; and the amount of gas is therefore comparatively small. The gas is burned to complete combustion; and the heat so obtained is used to raise to incandescence a cone made of various oxides of metals and other bodies.

The apparatus is made in three different sizes—known as the "S," "C," and "D" burners. I have tested the two first of these sizes; and the results show that in the case of ordinary burners, the best results for the gas burned are yielded by the larger sizes. Working with a gas which, when tested with ordinary burners, was equal to 25-candle power for each 5 cubic feet consumed, or to 5 candles per cubic foot, I obtained from the "S" burners a light equal to 10·66 candles per cubic foot, or 53·30 candles per 5 cubic feet. The "C" burner gave 21·25-candle power per cubic foot, equal to 106·25 candles per 5 cubic feet. The consumption of gas with the "S" burner was 3 cubic feet; and with the "C" burner, 3·2 cubic feet.

Tested with high-class oil gas, there was a heavy deposit of carbon on the mantle, which quickly destroyed its efficiency. By reducing the quantity of gas passing through the burner, and increasing the quantity of air, the Company have produced a fairly good oil-gas consumer. With 1·8 cubic feet of an oil gas which, when tested in the ordinary way, was of 56·60-candle power per 5 cubic feet, I obtained a light equal to 83·30-candle power per 5 cubic feet. For oil gas, however, the Company will yet require to modify their burners.

That a still greater result can be obtained from the gas, is shown by a modification of the Welsbach burner made by Mr. W. Penman, C.E., of Edinburgh. Mr. Penman's burner was constructed for photographic lantern work; and its peculiarity lies in the introduction of a very slight proportion of oxygen into the flame itself. By this simple addition, a gas of 5-candle power per cubic foot, which, with the ordinary Welsbach "C" burner, gave 12·39-candle power, was raised by Penman's burner to 18·81-candle power; or, in other words, for every candle power given by the ordinary burner, the Welsbach gave 2·47 candles, and the Penman 3·76 candles. This burner burns oil gas splendidly. Working with oil gas of 12-candle power per cubic foot, and which without oxygen gave 16·25-candle power, I got 67·64-candle power, or equal to 338·20-candle power per 5 cubic feet. This is, therefore, very much higher than even the extraordinary results obtained with acetylene.

Penman's burner having been manufactured purely for photographic lantern work, the oxygen was only introduced in front, and a platinum plate is placed behind. Lately I have been working with a burner built on the same principle, but with an oxygen-feed all round. My results are satisfactory; but, as they are not yet completed, I do not desire to quote them.

In the preceding remarks, I have endeavoured to place before you as simply as possible the results of the latest researches. They show that gas need not yet "throw up the sponge" in favour of electricity or any other illuminant. How far we may yet compel gas to yield us still greater illuminating value, must rest with the future. Even "second sight" cannot soar to the heights of possibility.

The Hon. Secretary thought there were very few there who were capable of making any very pertinent remarks on such a lecture as that to which they had listened; and he thought it only remained for them to express their heartiest thanks to Professor Macadam for the great trouble he had put himself to, in coming from Edinburgh with all his various appliances, in preparing the lecture, and presenting to them some facts concerning their profession in such a lucid and interesting manner. He had great pleasure in proposing that their heartiest thanks be accorded to Professor Macadam for his valuable lecture.

The President was sure it was the wish of everyone who had listened to the lecture to follow the proposal of their worthy Secretary. He did not think he could add anything to it. The members were under a great debt of gratitude to Professor Macadam for the splendid lecture he had delivered.

Professor Macadam said he was very much obliged to them for their vote of thanks. He had very pleasant recollections of his visit to Ireland two years ago; and he could assure them it had given him the greatest pleasure to come again.

VOTE OF THANKS TO THE PRESIDENT.

Mr. LOVE proposed a hearty vote of thanks to the President for the able and efficient way in which he had conducted the meeting. Mr. Salmon had, he said, a way of his own, which endeared him to all of them; and he thought he had that day shone in the position in which they placed him. He had filled the chair not only with credit to himself, but with credit also to the Association.

Mr. TULLY, in seconding the motion, endorsed all that Mr. Love had said.

The PRESIDENT said, in his opening remarks, he stated that he could not find words in which to express his sense of the honour they had conferred upon him. He could assure them he took it as the very highest honour which could be conferred upon anyone, to be made President of an Association like theirs.

In the evening the members dined together in the White Horse Hotel, under the chairmanship of Mr. Salmon; and on the next day (Wednesday) a very successful excursion was held in the finest possible weather for such a purpose. The places visited were: The round tower and ancient sculptured crosses in the churchyard at Monasterboice; the ruins of Mellifont Abbey; the site of the battle of the Boyne; and the Druidical caverns at New Grange. A small party proceeded further and visited Slane, where St. Patrick is reported to have lighted the paschal fire on his landing in Ireland. Almost any one of the above objects would have proved sufficient, in itself, to provide the required entertainment, but when, in addition to the rich programme presented, it is taken into account that, in order to visit the places selected, it was necessary to drive through more than twenty English miles of charming landscape, it is superfluity to say that everyone who was present was highly delighted with the day's outing arranged for them by Mr. Whimster and Mr. Martin, the Manager of the Drogheda Gas-Works.

Oil-Gas Tar Paint for Ironwork.—MM. Kolker and Naphtali have effected some improvements in the production of paints suitable for coating iron and other surfaces. They take the tar obtained in the production of oil gas, and subject it to fractional distillation up to a temperature of 250° C., when about 11·35 per cent. will have distilled over. The remaining 88·65 per cent. forms a glossy black mass, having the consistency of honey, and a specific gravity greater than that of water. It is dissolved by the aid of heat to about half its weight of volatile hydrocarbons, such as benzene and the like; and a paint is thus obtained which dries very rapidly, adheres well, and does not crack or fall off. It is claimed for it that it will penetrate through iron rust, and prevent further oxidation of the iron. Manganese or lead driers may be added, if desired.

Electrolysis of Gas and Water Mains in Brooklyn.—The Board of Commissioners of Electrical Subways of Brooklyn lately submitted to the Mayor a report calling attention to the danger of corrosion of the water-mains by currents of electricity escaping from the trolley railways. The Board had a survey made by an expert, who suggested a means of preventing the destruction—at all events for a time. It consisted in the attachment of a conductor to the water-mains at frequent intervals; and it proved effective. The Trolley Company proposed to apply the remedy in other places. But the Commissioner of City Works refused to grant the necessary permission; and the Company will consequently have to rely upon one of the other methods for the return of their currents to the power stations. These are: (1) Welding the rails at every joint; (2) employing a heavier copper bond at the rail joints; (3) making frequent connections between the rails and a return conductor of suitable dimensions, which may be either buried in the ground or preferably carried on the pole-lines back to the station. All three of these methods have been employed in various parts of Brooklyn; but the report says that in many places the current still escapes from the rails, and is conducted by the gas and water pipes.

The Effect of the Last Coal Strike.—In a recent issue of the JOURNAL, we alluded to some remarks made by Lord Claud Hamilton, in his capacity of Chairman of the Great Eastern Railway Company, on the effect of the coal strike of 1893 on the carriage and consumption of coal. Lord Stalbridge spoke in much the same strain at the meeting of the London and North-Western Railway Company last Tuesday. He said there had been a decrease of something like £80,000 in the Company's mineral traffic; and it looked very much as if the effect of the coal strike had been to lose this country some trade which it would never regain. The loss in the mineral traffic of the Midland, which was a heavier mineral line than their own, coupled with that on their line, was very large indeed. He hoped it would not be the case that this country had actually lost for ever some of her trade in conseqence of that great strike. The Right Hon. D. Plunket, M.P., when presiding at the meeting of the North London Railway on the following day, told the shareholders that there had been a slackness in the coal traffic all over the country; and he said he was afraid they must realize that they were still suffering from the effects of the disastrous coal strike of 1893. What was still worse, he added, certain portions of the coal traffic seemed to be permanently leaving this country—a circumstance most prejudicial to the interests both of capital and labour.

AMERICAN WATER-WORKS ASSOCIATION.

Water-Works Management—Water Supply by Meter.

At the last Annual Meeting of the American Water-Works Association, a paper on "Water-Works and their Management" was presented by Mr. L. M. Case, the Superintendent and Secretary of the Detroit (Mich.) Water-Works. The following extracts from the paper are taken from the report of the proceedings in the *Engineering Record*.

In the establishment and conduct of water-works, three important subjects for consideration stand out prominently—the quantity pumped, the quality of the water, and the just and equitable charge to be made for its supply. As regards quantity, I think I may say that 60 gallons daily per head is a generous supply; and therefore it is the duty of the purveyor to use every reasonable and lawful means to prevent greater consumption. The restriction of lavish use and waste correspondingly lightens the burden resting upon the consumer to provide engines, pipes, fuel, &c., which such use and waste necessitate.

The services rendered to the people in the construction and operation of water-works are threefold in their nature; and, being of entirely different and distinct characters, the payment therefor is required to be made each upon a different basis. The first and most important, and also the most comprehensive, of these services is the furnishing of an article of consumption, which includes water for all manufacturing and business purposes and for family and household uses. The expense of supplying this article of consumption, like every other, depends upon the quantity supplied; and it should be met entirely upon that basis. This necessitates the making of water assessments under a schedule of rates, framed upon the basis of such consumption, and from which all expenditures necessary to such supply should be paid. This is an individual service, depending upon individual needs and wishes, and should not be thrown into the class of general taxation to be paid for on the basis of valuations.

The second service rendered is the protection of property from fires, and the supply of water for public purposes in public buildings, parks, &c. The benefit derived from this service is largely protective, and is directly in proportion to valuations; and it very properly should come from the general tax levy. Estimates for this expense must be largely theoretical; but, taking into careful consideration the necessary operating expenses, and also those for construction, required to afford this protection and supply, I have placed it at about 20 per cent. of the entire expenditure of the department.

The third service is the extension of distributing-mains in new territories. This expenditure is to satisfy a local necessity; and it seems eminently just that the locality requiring it should meet such expense, and that consumers of water, who have already, in the water-rates, paid for the pipe in front of their own premises, should not have the additional burden imposed upon them of being required to assist in paying for such extensions in other localities. It often arises, however, that other needs require the laying of larger pipes in a street than the necessities of the street itself would call for; and therefore some fixed size should be established, and the cost assessed to abutting property. The minimum pipe, it is fair to say, would answer the purposes of any lot, were that lot and its occupancy alone in question; and therefore it is only equitable that the expense of laying that size should be met by such special taxation, and the increased expenditure for laying a larger main be taken from the water-rates. In accordance with this idea, the Board of Water Commissioners of Detroit applied to the State Legislature for an Act authorizing the imposition of a special assessment upon abutting property by which water-piping is laid; but no lot or lots were to be assessed for a larger sum than a proportionate share for laying and constructing a pipe or main 6 inches in diameter.

With the expenditure of a water department provided and arranged for under these three classifications, it seems to me that all claims for justice and equity in this particular will be satisfied, ordinary rates materially reduced, and individuals required to pay for such expenditure only as their needs and necessities create or cause.

In regard to the establishment of rates, both "assessed" and "meter," there seems to be a wide range throughout the cities of the United States, varying as much as the habits and characteristics of the people. While it may be impossible to establish a uniform basis of rates, owing to our different conditions and environments, I am satisfied that a much greater uniformity than now prevails could be obtained. To me the idea of a community composed of free and independent citizens, all with equal rights before the law, establishing a water-works for their mutual and individual benefit, and then arranging the rates so that one individual would pay more for the water he consumed per unit than another individual, is inexcusable. It is true that a larger quantity can be furnished at less cost than a smaller quantity; and were each individual supplied through a separate pipe from the works, there might be some excuse for a difference in the rates for large and small consumption. But, inasmuch as the waters are driven by the same pumps, at the same time, through the same pipes, and each gallon therein

costing exactly the same amount, the idea of one individual being obliged to pay more for a gallon than another seems to me to be unsustained by any law of reason or justice.

The construction and operation of works should be conducted economically; bearing in mind, however, that penuriousness is not economy. The purchase and placing of meters, commencing during my first year as Manager of the works, and continuing systematically since, has been denounced as outrageously extravagant; and yet the Board of Water Commissioners have saved to the people at least $200,000 over and above the cost of the meters (which they still have), in their operating expenses, and in the interest upon, and depreciation of the values of, the construction that the excessive consumption demanded. In regard to the prevention of waste, I think it is not generally understood how thoroughly these little tireless and sleepless machines accomplish the desired results. I feel perfectly confident, from my experience, in stating that the saving, over and above such cost, is double the expense of the purchasing and placing of meters.

The paper was followed by a discussion, in the course of which Mr. F. A. W. Davis, of Indianapolis, remarked in regard to the suggestion that there should be a uniform rate, that the cost of the plant, the number of consumers, &c., ought to be duly considered. Mr. Linneen said a fixed schedule of water-rates, however suitable it was in Detroit, might not be equitable in other cities. A large consumer should, he thought, pay a lower rate than a small one. In the case of plant pumping 3 million gallons daily, the water could be sold at a lower rate than was charged where only a million gallons were pumped. Mr. Benzenberg said he gathered, from conversations he had had with the writer of the paper, that he did not believe in uniform rates throughout the country; absolute uniformity being out of the question. A gravity system could furnish water for less than a pumping system. Another point was the expense of reading meters. This was naturally less in the case of a single consumer using (say) a million gallons a month, than in that of a large number of small consumers. Mr. Denman pointed out that a 1-inch pipe might be sufficient for certain premises; and therefore he did not see why the occupier should be taxed for a 6-inch pipe. Mr. Milne remarked that there were often cases requiring the introduction of a larger water-main in a city. The application of the tax to raise money to pay for that main was what was evidently in the author's mind. He believed Mr. Case to be right in one thing—viz., one rate for the consumption of water through a meter. The question of rates had been under consideration in Brooklyn for a number of years; and now it was 1 c. per 100 gallons for all consumers. The water-rate in Brooklyn was uniform; and one-fifth of the entire revenue came from the meter system, and four-fifths from the sugar refineries. Mr. Davis said he did not think it possible to furnish water at the same rate in all cases; and he cited various local conditions which made varying rates necessary. Mr. Benzenberg referred to a property tax for water-pipes as being in the same line as the tax for sewer or street work. This idea was criticized by Mr. Linneen. Sewers, street work, &c., did not, he said, bring in any revenue; whereas a water-pipe did. To tax property for a water-main on a frontage tax was, in his opinion, unjust.

On the same occasion, a paper entitled "Our Experience with Water-Meters" was read by Mr. J. B. Heim, the Superintendent of the Madison (Wis.) Water-Works. The following are the principal points in the paper:—

The question of selling water by measurement has taken rapid strides within the last few years; but it is as yet in its infancy. The plan still prevailing in most cities is to connect meters only with the services of large consumers, manufactories, &c., in order to check the waste. The advocates of that plan, however, lose sight of the fact that the waste is really greater on the domestic services, taken as a whole, than on those of the larger concerns. Nevertheless, the adoption of the meter system is the only course to pursue to meet the emergencies which must arise; and the plan, when once adopted, must be followed consistently and fearlessly. If that policy is inaugurated, then the result will be, as it has been with us, a general demand for the introduction of meters.

Madison has an artesian well supply, which is in general limited. The excessive sprinkling of lawns and streets in the summer, and the continuous flow in the winter to prevent freezing, were causes of a waste which steadily increased in proportion to the consumers. Finally, on a December night in 1886, during a fire which lasted nearly three hours, the pressure was gradually reduced from 120 lbs. to 65 lbs., which meant only 33 lbs. in the business portion of the city. We finally lost suction; but, fortunately, not until the fire was under control. This at once led to an inspection, which seemed to aid us to some extent.

The meter question had been discussed in our city for several years before that time; but even the occurrence just detailed was insufficient to overcome the prejudice which existed. The following season, as soon as sprinkling commenced, our troubles began again. On April 24, 1887, our pumping for 24 hours was 455,400 gallons; and it gradually increased until, on Aug. 9 of that year, it reached 1,016,500 gallons. We were then obliged to cut off all sprinkling; and we carried on an inspection until the season closed. But when cold weather came, inspection proved a failure; and a different method had to be adopted. More wells were added; but this step was accompanied by an increase in the number of takers, and so resulted in no permanent relief. Finally, we were driven to the adoption of meters. It was an unpopular measure, and was fought inch by inch by its opponents.

We began the placing of meters on May 21, 1888; and by the 20th of August following, we had 130 in place connected to services where we had discovered the greatest waste. Our pumpage was immediately reduced by an amount reaching 19,677,300 gallons when compared with the corresponding five months of the preceding year. The consumption of coal during the same months showed a difference of 66,500 lbs. in favour of the latter year. Anthracite grate coal was used, costing $6·24 per ton in 1887, and $8·33 in 1888; and, notwithstanding the additional cost of $2·09 per ton in 1888, the total cost of coal in that year during the sprinkling months, with but 130 meters attached, was only $142·33 more than during the corresponding season of 1887.

To overcome the prevailing prejudice, the Board of Water Commissioners decided to furnish the meters free, with no monthly rental, and also to connect them to the services free of charge for the years 1888 and 1889. The plan was adopted of first metering all services paying $15 and upwards per annum, then those paying $12, then those paying $11, and so on. A low rate was adopted, with a sliding-scale—the minimum rate being placed at $5 per annum. The maximum rate is 20c. per 100 cubic feet for those using 6000 cubic feet or less in six months. For those using more than this amount, the rates are fixed at 19 c., 18 c., 17 c., and so on, until we reach 5 c., per 100 cubic feet, which is the minimum rate, and is that charged to consumers of above 60,000 cubic feet in six months. On Sept. 30, 1894, we had 1820 takers and 795 meters.

In order to fully appreciate the results accomplished by the adoption of the meter system, the author of the paper gave a comparison of the years 1884 and 1885, when there were no meters attached, with the years 1893 and 1894, with 795 meters connected. The accounts were very fully analyzed; and it was stated that the saving of fuel in the six years since the adoption of meters had alone been sufficient to cover all expenses of purchasing and placing them.

Mr. Heim's concluding remarks were as follows: The meter system has become popular; and the Water Commissioners are under the necessity of strictly adhering to the rule that no one who pays less than $8 per annum is entitled to a meter, unless he uses the water through a yard hydrant for sprinkling purposes, or desires to do so. Before one is set, it is thoroughly tested from a 1-32nd to a ¼-inch jet—a variation of 2 per cent. either way being accepted. We guarantee every meter that is placed. In case of a disputed bill, we re-test the meter for the consumer, if so desired; and if found incorrect, water-rent for the next six months is not charged. Thus far the city has not been under the necessity of extending this favour. In the office, we have a meter with a glass top with which to show its working, in order to demonstrate to patrons that no more water can be registered than passes through it. We buy our specials; and in case any parts are destroyed, the city replaces them at cost price. The licensed plumber has to remove and replace them. The system has brought with it a better class of work, and the most improved fixtures. The problem of additional water supply which stared us in the face has been solved. Our engines and pumps have been fully adequate, notwithstanding the increase in the number of takers; and instead of expending at least $200,000 for an additional water supply and machinery, we have been able to meet all demands, and at an outlay of only $21,733, which has been fully saved upon the cost of coal by the decrease in the amount of pumping since the inauguration of the meter system.

The Heating Value of Coal Gas.—With reference to the paper on the above subject read by Mr. D. Vass at the recent meeting of the North British Association of Gas Managers, and given in the JOURNAL last week, we learn that Messrs. Alexander Wright and Co. have a form of calorimeter, devised by Mr. J. Emerson Dowson, which is easy of manipulation, compact, and inexpensive. Mr. Frank Wright hopes soon to be in a position to publish some interesting data as to the calorific value of gas of varying candle powers; but, in the meantime, he will be pleased to furnish particulars of the apparatus to anyone interested in the subject.

Quinoline Bases in Brown Coal Tar.—An account of some investigations into this subject has been given by Herr O. Doebner in the *Berichte*. In experiments made with brown coal tar taken from Riebeck's works at Webau, the higher boiling portion (220° to 280° C.) was found to contain a mixture of quinoline bases and probably pyridine bases. Quinoline itself was isolated from the fraction of the oil distilling over between 235° and 245° C. The other bases contained in the higher boiling oil and also in this fraction of it, have the properties of quinoline bases, but were not isolated. The occurrence of these quinoline bases in brown coal tar, in which pyridine bases, benzene and its homologues, naphthalene, picene, chrysene, phenol, and the cresols have already been detected, affords a further proof of the analogy between the constituents of brown coal and hard coal tar.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Gas-Flames and Luminosity.

SIR,—In your article on my paper, where you refer to the statements I made *re* the action of water on the illuminating power of gas, you infer that, in the ordinary scrubbing process, the loss of illuminating power must be very great. This, however, seems to me to be overstating the case. In my experiment, equal volumes of water and gas were employed; but in the scrubbing process—even including that condensed from the mains—the proportion of water to gas is not more than 1 to 2000, and I calculate that the loss due to this cause is not more than $\frac{1}{10}$ candle. The same holds good regarding wet meters. After a cubic foot or so of gas has passed through a meter in which there is (say) a gallon of water, that water will have become saturated with benzene, and will then cease to absorb any more; and the illuminating power of the gas will be in future unaffected by its passage through the meter.

Where the solvent action of water may cause serious inconvenience is in experimental work—say, when gas has been collected in a small gasholder charged with fresh water, the latter bearing a considerable proportion in volume to the total gas collected. Unless water repeatedly treated with gas be used, too low results are almost bound to be obtained.

Referring again to burners, it was not my intention specially to draw attention to the fact, which everyone knows, that one burner gives a better result than another on any given gas, but to show the different effects of various enrichers on different burners. I do think, however, that every gas company should inform their consumers as to the burners best adapted to the gas supplied for both household and outdoor use, and do its best to induce them to use them.

Manchester, Aug. 17, 1895. WILFRED IRWIN.

Comparative Cost of Electric and Hydraulic Power.

SIR,—Is there not an error on p. 333 of this week's JOURNAL, when it said that 2·76d. per Board of Trade unit is equal to 3d. per brake horse power per hour?

Supposing that a dynamo had an efficiency of 90 per cent., it would require $\frac{1000}{\cdot 9} = 1111$ watts. But, as a brake horse power is only 746 watts, the unit would be $\frac{1111}{746} = 1 : 1{\cdot}49$, or (say) practically the Board of Trade unit equals $1\frac{1}{2}$ brake horse power. If the brake horse power costs 3d., the unit would cost $4\frac{1}{2}$d., and not 2·76d.

Cork, Aug. 14, 1895. DENNY LANE.

[The statement here referred to was Mr. Ellington's, not ours.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Thursday, Aug. 15.

Pursuant to resolutions passed on the 4th ult. respecting Provisional Order Confirmation Bills, prints of the Gas Orders Confirmation Bill and the Gas and Water Orders Confirmation Bill as considered by the House in the previous session, together with a declaration in each case signed by an officer of the department by which the Orders to be confirmed by the Bills were made, were presented, read the first and second time, Committees negatived, read the third time, passed, and sent to the Commons.

HOUSE OF COMMONS.

Friday, Aug. 16.

PRIVATE BILLS SUSPENDED.

Mr. MELLOR proposed the following motion; and it was agreed to: "That the Standing Orders of July 2 last for the suspension of Private Bills, or Bills to confirm any Provisional Order or certificate, be now read, and that the same be held applicable to the next session of Parliament, excepting in the case of certain Bills to confirm Provisional Orders or certificates suspended in the last session of Parliament under the said Orders, and which are reintroduced into this House under the said Order in the present session."

WATER SUPPLY IN EAST LONDON.

Mr. PICKERSGILL asked the President of the Local Government Board (Mr. Chaplin) whether, in view of the great danger to health, inconvenience, and discomfort arising to the inhabitants of East London from the insufficient quantity and bad quality of the water supplied to them by the East London Water Company, he proposed to take any, and what, steps in order to enforce upon the Company their statutory obligation to give a constant supply.

Mr. J. STUART said, before the right hon. gentleman answered the question, he would ask him another, of which he had given him private notice—viz., whether his attention had been called to the report, dated July 30, of the Chief Engineer of the London County Council, in which, after the examination of certain facts as to the quantity of water supplied by the East London Company before and after the frost of last winter, that gentleman stated as his opinion "That what the Company are now suffering from is not an insufficiency of supply, but that their pipes became so shattered during the frost of February last as to become so leaky that the water is wasted and does not reach the consumers;" whether he was prepared to make any inquiry as to the correctness of this opinion; and whether, if it was correct, he would take any steps to require the Company to put their mains in proper repair.

Mr. CHAPLIN: With regard to the supplementary question, I am under the impression that the Engineer of the East London Water Company denies the allegation of the Chief Engineer of the County Council. But I only received the question of the hon. member a few minutes before coming to the House; and it has been impossible to refer to the reports. With regard to the question on the paper, it has been a matter of much regret to me that so large a proportion of the inhabitants, and many of them the poorest, of the district included in the limits of supply of the East London Water Company have been put to very serious inconvenience by the limitation of the hours during which a supply was obtainable; and, as I could not but feel that a continuance of this limitation of the supply might be attended with danger to the public health, the condition of things has caused me some anxiety, and the matter has been receiving my constant attention. The difficulty in which the Company have been placed has been occasioned by the exceptional drought which existed until very recently and the insufficiency of the means of storage possessed by them. It is not requisite that I should refer to the circumstances under which Parliament, in 1893, rejected the Bill promoted by the Company with a view to obtaining further powers for carrying out the additional works required. I will only say that I am assured that, since Parliament granted the necessary powers in 1894, the Company have been proceeding as rapidly as possible with the execution of the works which they were fully aware were needed. The Water Examiner under the Metropolis Water Act, 1871, has been in frequent communication with the Company, in order that I might be informed precisely of the position of matters; and I have visited some of the poorer localities in the district, that I might see for myself how occupiers of small house property were being affected by the difficulty. The Company have, in a large number of streets, set up stand-pipes attached to the mains which were constantly charged with water; and this has, no doubt, been very helpful to a great number of persons when the ordinary supply was cut off. Allegations have been made as to a very serious increase in the mortality in the district of the Company. I have caused inquiries to be made on this subject, in connection with the returns of the Registrar-General; and I am glad to be able to state that, so far as means of comparison exist, it would appear that the mortality of the district supplied by the Company has not been greater than in districts within the limits of supply of other Water Companies where there has been no deficiency. As regards the statutory obligation of the Company to give a constant supply, I must point out that, by section 15 of the Metropolis Water Act, 1871, it is provided that a water company shall not be subject to any liability for not giving a constant supply when the want of such supply arises from unusual drought or other unavoidable cause or accident. I am glad to be able to state that I am informed by the Company that they find that, through the recent rains, they may now safely extend the hours of supply from to-morrow; and that water will be turned on at about six in the morning and be left on until about five in the afternoon daily. This is the fullest information I am able to give.

The House having decided that the consideration of all local and personal Bills suspended prior to the dissolution should be further deferred until next year, the following Bills in which our readers are interested stand over: Barnsley Corporation Water Bill, Chelsea Water Bill, Chelsea Water (Transfer) Bill, Dewsbury and Heckmondwike Water Bill, East London Water (Transfer) Bill, Grand Junction Water (Transfer) Bill, Kent Water (Transfer) Bill, Lambeth Water Bill, Lambeth Water (Transfer) Bill, New River Water (Transfer) Bill, Rotherham Corporation Bill, Southwark and Vauxhall Water (Transfer) Bill, and West Middlesex Water (Transfer) Bill. The Chelsea Water Bill, the two Lambeth Bills, and the Southwark and Vauxhall Bill have been committed; the others await second reading.

The Gas Orders Confirmation Bill and the Gas and Water Orders Confirmation Bill were last Thursday brought from the Lords, read the first time, and referred to the Examiners.

The Nidd Water Scheme of the Bradford Corporation.—Some time ago, a claim made by Mr. W. Ferrand in respect to certain property, belonging to him at Cottingley, required by the Bradford Corporation as part of their Nidd water scheme, was submitted to arbitration; Mr. B. S. Brundell, of Doncaster, being the Umpire. Mr. Ferrand asked £3028. His valuer (Mr. W. Middleton, of Bingley) estimated the worth of the property taken at £1168; and they claimed £1200 for damages to his adjacent property, £500 for general depreciation of the estate, and £160 for disturbance during the execution of the works and an additional watcher. The valuer for the Corporation (Mr. T. Fenwick, of Leeds) estimated the worth of the land interfered with at £697; but they contended that the question of alleged damage was purely sentimental. The Umpire has awarded £958.

The Cost of the Litigation between the Bradford Corporation and Mr. Pickles.—This matter, the final stage of which was recorded in our "Legal Intelligence" last week, was referred to at the meeting of the Bradford Town Council on the 13th inst., by the Chairman of the Water Committee (Alderman Holdsworth). He said the Committee had done what they considered to be fair and right; and he thought the decision of Mr. Justice North, after hearing a score of witnesses, and having the assistance of three Counsel on each side, had amply justified the Corporation. He contended that Mr. Justice North was the most competent Judge to deal with the question, and to come to a correct conclusion on the merits of the case. He felt that if the decision of the House of Lords was a correct one, the Acts of Parliament of the Bradford Corporation were worth very little indeed. To set alongside of his statement on this subject, he had some very favourable figures with regard to the receipts for the use of water by meter. The income from this source had augmented to the extent of £2348 in the first quarter of the present year, by comparison with the first quarter of 1894; and the increase in the second quarter had been £3698. This showed that there must have been considerable improvement in the state of trade; and the total increase in the receipts was about sufficient to pay the costs of the Pickles case, which would be between £5000 and £6000.

LEGAL INTELLIGENCE.

A Question as to a Sale of Engines.

In the Queen's Bench Division of the High Court of Justice last Saturday week, before Mr. Justice Grantham, an action was brought by the Tonbridge Water-Works Company, Limited, to recover from Mr. Cohen the sum of £150; being the agreed price of two engines sold to him. In April of the present year, the plaintiffs had at their works two engines for which they had no longer any need; and on the 19th of the month, they advertised for offers for them. The defendant wrote: "Please let me have specification, maker's name, form of tender, and lowest price for the engines you have for sale." Specification and full particulars were sent; and on May 6 he wrote offering "£150 for the two engines, free on rail at Tonbridge." Plaintiffs replied, stating that the offer would be laid before the Directors, and wishing to know what sum would be charged if the larger engine were kept for two months as a "lay-by." Defendant said he would agree to this, provided £20 were allowed to meet the extra cost of carriage. On May 10 the Directors accepted the offer of £150, but declined the proposal as to the £20. For the defence, it was argued that there was no clear and concluded contract between the parties; and, in the alternative, that there had been no tender or delivery by the plaintiffs. His Lordship held that the letters disclosed a binding contract; and he gave judgment for the plaintiffs for £150, with costs.

A Claim in Respect of Gas-Engine Starters.

At the Newcastle County Court on Monday last week, before his Honour Judge Greenwell, Messrs. H. Watson and Son, engineers, of Newcastle, brought a claim against Messrs. Crossley Bros., Limited, in respect of some gas-engine starters, which, as they alleged, did not do the work for which they were warranted. Mr. Hedderwick appeared for the plaintiffs; Mr. Temperley, for the defendants. Mr. Hedderwick said the claim was for £15, the price of three Lanchester starters, and an implied warranty that the starters were fit for the purpose for which they were made; and, in the second place, an agreement to take the starters back at the original price paid for them. The defendants had at Newcastle a Mr. Ellis as their agent. In the year 1892, the plaintiffs built new workshops; and they desired to obtain engines of a suitable character for their business, and applied to the defendants, among other people, for engines such as would meet their requirements. On Jan. 7, 1892, the plaintiffs agreed to purchase from the defendants five gas-engines, for a lump sum of £1240. There were present at the time the bargain was made, Mr. Urwin, the Engineer to the defendants, and Mr. Huffam, who, he presumed, was their Manager; and they urged upon Messrs. Watson the desirability of their purchasing, in addition to the engines, some Lanchester starters, the price of which was £5 apiece. They were told that these starters would save hand labour, and would start the engines immediately. The plaintiffs agreed to increase their order as suggested. The engines and starters were sent; but the starters were found to be useless—requiring considerable hand labour to start them. The defendants sent their Engineer to see what was the matter with them; but he was compelled to go away leaving the starters practically no better than they were before. The plaintiffs complained, and the defendants replied that the starters were never represented as fit to start the engines with the shafting on; and they offered to take the starters back, and to supply their patent pump-starters, which would start the engines with the shafting on, at £15 each. His Honour gave judgment for the plaintiffs for £15.

Incandescent Gas-Burners for Public Lighting at Ipswich.—At the quarterly meeting of the Ipswich Town Council last Wednesday, the Paving and Lighting Committee presented a report recommending that a contract be entered into with the Ipswich Gas Company for fitting 879 public lamps with incandescent gas-burners, in place of the existing 5-feet burners, at £3 11s. per lamp where the columns belong to the Company, and £3 9s. per lamp where they are the property of the Corporation; the hours for lighting and extinguishing to be the same as at present. Mr. G. F. Josselyn, in moving the adoption of the report, explained that from the 879 lamps to be fitted with incandescent burners a light of 40-candle power each would be derived, in place of the 14-candle power previously given. He said the Gas Company, who had met the authority very fairly in the matter, were prepared to spend from £800 to £1000 over the installation of the new lamps; and the cost to the town would not exceed £90 or £100, or about £20 less than the estimate of the year for improved and better lighting. The result of the change would be that Ipswich might lose the unenviable reputation of being a badly-lighted borough. The report was adopted The new contract is to run for three years.

Completion of the New Water-Works for Baildon.—The official inspection which the members of the Baildon District Council recently paid to the reservoir at Hawksworth Moor, marks the completion of an extensive and costly scheme. The construction of the reservoir has been a work of four years' duration. Almost from the date of the formation of the Baildon Local Board, in 1852, the water-works have entailed serious charges upon the township; and it is a matter of much satisfaction that the district has now a provision which is calculated to meet the requirements of the next thirty years. In pursuance of parliamentary powers granted in 1890, the Board entered upon a scheme which was estimated to cost £16,000, and which would provide a reservoir of 30 million gallons capacity. About 21 acres of land were secured; and work was proceeded with for the construction of a reservoir measuring 8 acres at the top water-level, and capable of storing, at the deepest point, 30 feet of water. The specifications have been complied with, except in regard to cost. The soil proved to be rocky, and the puddling was insufficient, with the result that some of the work had to be done over again; and it is probable that, when the whole cost comes to be reckoned up, it will not be less than £30,000.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Bridge House Hotel, London Bridge, last Wednesday—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the notice convening the meeting, and the minutes of the last meeting; and the report of the Directors was taken as read.

The CHAIRMAN said that, before proceeding to deal with the very important business in paragraph 6, to which he would have to ask their patient and earnest attention presently, it was necessary for him to make a few remarks on some of the other paragraphs in the report. The first point he would refer to was mentioned in the first paragraph—the reduction in price. They had now come down to the old figure of 2s. 3d. per 1000 cubic feet. They would perhaps ask why they had reduced the price. His answer was that a low price meant an increase of business, which strengthened their position. It also meant that it enabled them to add to their reserve; and to restore it to something approaching what it was before. This was the only way in which they could increase the reserve fund. When he reminded them that the reserve, which formerly exceeded £250,000, was reduced three years ago to about £40,000, he thought they would agree that it was necessary to build up the fund again. Ultimately, too, the reduction of price was the only means by which they could increase the dividend. At present, as had been explained to (and approved by) the proprietors, it was not thought advisable to increase the dividend while the reserve fund was at a low figure; but when they got the fund up to a satisfactory amount, then unquestionably the reduction of price would entitle the shareholders to, and they would have a right to expect, an increase of dividend. He did not, however, think he could promise that yet. While on the subject of the reserve, he might mention that of the £5896 added to it on the present occasion, £3437 came from the "A" stock—being 1⅜ per cent. on their capital; £1687 from the "B" stock—¼ per cent. on their capital; and £771 from the "C" stock—½ per cent. on their capital. The "A" stock had therefore contributed about three-fifths of the increment to the reserve. This was according to the Act of Parliament, and could not be altered. There was another way of building up a so-called reserve; but the Directors considered that this was not the legitimate method. It was possible to accumulate a very large undivided balance. They could keep up the price of gas, so retarding business, but adding to surplus profits, and carrying them forward half year by half year, till a very large amount was accumulated. This was not a violation of the letter of the Act; but it was certainly a violation of its spirit. When the Act was passed in 1876, it was set out that there should be no increase of the reserve fund except by the shareholders foregoing dividend; but they were allowed to carry forward an undivided balance. They might depend upon it, however, that those companies which carried forward an unreasonable undivided balance, would find trouble in store for them when they next went to Parliament. They themselves preferred to carry out the spirit of the Act, and build up the reserve fund in the way provided by it. There was another reason why they did not propose to increase the dividend just yet—because they felt that every increase of dividend was now a very serious matter, considering the very high price their stock had reached in the market; and if they were to add ¼ per cent. to the dividend, it was probable that the stock would go up another 10 in the market. People who bought the stock at these very high figures would be much disappointed, and very angry probably, if in the course of a few years it should be found necessary to reduce the dividend, and thus diminish the market value of their property. They therefore felt that it was not right to increase the dividend until they were as sure as anyone could be that the advance would be maintained. Another paragraph in the report related to the price of coal. They had had some little difficulty in renewing their contracts. In 1894, there was a combination of coalowners, who succeeded in putting up the price somewhat, and they and the other companies had to pay a higher price; but this year the combination had fallen to pieces, and they had been able to make their contracts at the market prices. But there had been a little difficulty. Their friends on the other side of the river put into their contract for 1894 a clause that if any of their contractors should sell in 1895 to the South Metropolitan Company at a lower price than their 1894 rate, their contractors were to give them a rebate on their 1894 prices equal in amount. They themselves had to circumvent this in some way; and the result was that they bought their coal this year at the market price. Their friends did not get the rebate, because this Company did not buy of their contractors; and the only thing he regretted about the matter was that in one or two cases an old-standing connection had been broken, and contractors with whom they had dealt for the past thirty years had been shut out in consequence of the absurd restriction to which he had alluded. He might refer incidentally to the effect of this increase in the cost of coal. It had caused a rise in the price of gas all over the kingdom; but he would only deal with London. They first of all tried to meet it out of their reserves, which were depleted very considerably to pay for the strike. This they would have got over; but the price of coal afterwards went up in consequence of the nonsense about the living-wage, strikes, and one thing and another, until it was found absolutely necessary to raise the price of gas. They took £370,000 from their reserve; and then they raised the price of gas, which took £220,000 from the consumers. In the case of their Company alone, therefore, the losses and expenses in connection with the labour troubles and coal strikes had been nearly £600,000. As to the rest of London, the increase of price of the big Company north of the river amounted to £1,870,000 in the three years; and that of the Commercial Company, to £90,000. The consumers of London, in consequence of the labour troubles and the high price of coal, had thus had to pay in the last three or four years £2,180,000 more for their gas, and something approaching that figure was also lost by the

Companies into the bargain. What the better were the men for it? They had gone back to their old wages, and thousands of them were to-day out of work. It was stated by the Chairman of the North Eastern Railway Company, at their meeting last week—quoting from the Board of Trade—that in the midland districts, where they had got the living-wage fixed, the men were working 3·65 days a week on the average; while in Northumberland and Durham, where the men were wiser, and had settled their differences as to wages by agreement, they were working 4·91 days, or nearly 5 days against less than 3¾ days in the other case. He could not see that any good had been done to anyone, but infinite harm all round, by the action of the men. It was now ten years since they had their last amalgamation, which dated from the beginning of 1885; and he was therefore able to make a comparison showing the Company's progress in this period. He found that the increase of business amounted to 70 per cent. The gas consumed in the June half of 1895 was 70 per cent. in excess of that in the June half of 1885. In that time, they had increased their capital 43 per cent., and the capital charges had only increased 25 per cent.—that was, their business had increased in a greater ratio than their capital, and they had raised their capital at a lower rate than before, mainly through the issue of debenture stock. He thought that this at all events proved one thing—namely, that an endeavour to meet the public by giving them every possible facility for obtaining gas, and by trying to sell gas at the lowest possible price, had told its tale; and he believed their increase of business of 70 per cent. in ten years was sufficient proof of this. It had had another effect. In the June half of 1885, they required 13¾d. per 1000 cubic feet to pay interest on debenture stock and a dividend of 12½ per cent., whereas in the June half of 1895, they required only 9¾d. to pay interest and dividend of 13 per cent.; so that, by the increase of business and the raising of capital at a lower rate, their capital charges were reduced by 4d. per 1000 cubic feet sold in the ten years. This was the best proof to his mind that their business was sound, and that it would remain so. Comparisons were said to be "odious;" but it was not always possible to form an opinion without them. He found that The Gaslight and Coke Company had increased their business by 24 per cent. in the ten years; and that whereas ten years ago the gas sold by the South Metropolitan Company was only 29 per cent. of that sold by The Gaslight and Coke Company, it was now 40 per cent. They were therefore gaining on the other Company hand over hand. He had now to correct one or two mistakes which had recently been made; and paragraph 7 of their report led him to it. This paragraph was as follows: "The Directors have again to express their satisfaction with the good and loyal spirit that animates their officers and workmen." They had what was called the Bonus Festival this year, as they had had it every year since the strike; and statements were made about the result of the profit-sharing business. Some of the newspapers had put the bonus in the year at £41,000; but this was not the case. The amount of accumulated bonus and savings of their workmen deposited with the Company up to a year ago was £38,000; whereas it was now £41,000. But beyond that, a year ago the workmen and employees had invested, in connection with the profit-sharing business, something like £17,700 in the Company's stock. That was now increased to £25,000; so that altogether on the 30th of June there was £66,000 standing to the credit of the workmen as the result of the profit-sharing arrangement. This he thought was pretty good proof that they had the workmen's confidence, and also that the arrangement was a success. He had never from the chair said one word about the electric light. As far as they were concerned, the electric light had gained no footing in their district. The Company, however, had shown them no antagonism, and their people had given them help in altering their mains when they—the electrical people—wanted it. But they were now getting a little spiteful. He had read in the *Electrical Review* this passage: "Their consumers' meters always seem to run very fast, as though trying to outrun the works meter." Farther on, the article continued—referring to the profit-sharing bonus—"They have such opportunities of squeezing another ten or fifty thousand out of the public by increased charges, or of saving at the works by reduced cleansing of the gas or a reduction of lighting power, that the great bane of profit-sharing—viz., a year with a loss—never occurs." This amused and pleased him, because when people began to get spiteful, it was a tolerably clear proof that they were losing. He now came to the important part of that day's business. Paragraph 6 of the report was as follows: "The Committee of the House of Commons having refused to sanction the conversion of the Company's stock from a nominal 10 per cent. into double the amount of 5 per cent. stock, the Board thereupon withdrew the Bill. In these circumstances, the Directors desire the opinion of the proprietors as to the expediency of re-introducing the Bill next session." He might as well, perhaps, quote what was said by the Counsel for the London County Council, who opposed their Bill, although really he did not think that Counsel had any instructions to specially oppose the stock-splitting proposal. He said: "What was good for gas companies was good for water companies. Grant this to water companies, and mark what would happen. . . . In case of purchase, that would involve an immediate and unquestioned rise in the purchase price of the water undertakings, as against the ratepayers of London." This was absolute nonsense; and there was not a shred of foundation for it. However, it had its effect on the Committee. This Counsel did not prove what he said by calling witnesses; and by not putting in evidence, he deprived the Company's Counsel of the opportunity of replying. After the Committee had deliberated, the Chairman said: "The Committee are not prepared to approve the preamble of the Bill, so far as the stock-splitting clauses are concerned." When that was announced, there were three of the Directors of the Company in the room. As that was the main object, their Counsel was instructed to withdraw the Bill. After that, the Committee of the House of Commons made this special report to the House: "That the Committee considered that the subject of conversion of stocks was one of so far reaching importance, that it ought to be dealt with by a Committee specially appointed to consider the same as affecting gas and water companies." There might be some members of Parliament present at that meeting, but one could not speak with the utmost respect always of members of Parliament; and at the very time when this sapient Committee were framing this resolution, the House itself was passing another Bill. In the very same week that the Committee rejected their stock-converting scheme, the House of Commons passed the Newmarket Gas Bill, which authorized precisely the same thing to be done; and a fortnight later the House of Commons passed the Scarborough Gas Bill, with a precisely similar clause authorizing the splitting of the stock. As to the objection of the Counsel representing the London County Council, he had said that it was nonsense, and that there was not a shred of foundation for it. The fact was that the conversion of stock would not affect the public in any way adversely, although it might benefit them by enabling the Company to issue stock at a little higher price. But with all the schemes of purchase with which he was acquainted, the market value of the stock had not been taken as the basis of purchase, but always the dividend or earning power. So many years' purchase had been given, based on the dividend or earning power of the undertaking. He therefore thought it was pretty clear that the objections raised by the Counsel of the London County Council were groundless. Moreover, in addition to the two Bills passed this year, when the House of Commons entirely ignored the recommendation of their own Committee, in 1891 the Bristol Company, in 1892 the Oxford Company, in 1893 the Crystal Palace District Gas Company, and in 1894 the Plymouth Gas Company, all obtained similar powers without any objection whatever. They were now going to ask the shareholders' opinion as to the advisability of reintroducing the Bill. He was not going to ask their opinion as to the principle of the Bill, as he considered that that was conclusively settled at the last meeting, and by what followed from that meeting. The Bill was laid before them for converting the stock. There was some little question as to the "A" and the "B" stock, and whether one of them was to get a little the better of the other. But the result of the meeting was a unanimous vote. There was one hand held up in the back of the room against it; but this person disappeared, and they could never find out his name. The probability was that he held up his hand against the resolution by mistake; and they might say that the meeting was unanimous. After the meeting, they endeavoured to get the assent of the shareholders; and although there were a few—perhaps half a dozen holders of the "A" stock and half a dozen holders of the "B" stock—who objected, when they got the Bill into Committee everyone had withdrawn his objection, and they were able to tell the Committee that their proprietors were quite unanimous in their desire for a conversion of the stock. He was therefore not going to suggest that the present meeting should redetermine that question. What had to be decided was whether they were to reintroduce the Bill. The advantages of unification and conversion of the stock were so clear that he need not dwell on them. One advantage not mentioned as to the unification was that at present there was a feeling or sentiment of—he did not like to use the word jealousy, but something approaching it, between the "A" and the "B" stockholders. One might think he did not get enough; and the other that he gave too much. It would be a very grand thing to have a perfectly united proprietary, to have one uniform class of stock held by the proprietors, and all possessing (and feeling sure that they possessed) perfectly identical interests. The great rise in values which had occurred since last year had raised the question whether they should split or double the stock—whether it would not be well to convert the stock into a 4 per cent., rather than a 5 per cent. stock. That, however, would be a matter for consideration if the meeting determined that the Bill should be reintroduced. He now came to the critical part of the subject. It was not usual for Directors to issue a report on an important question without making a recommendation. The fact was, as probably they were aware, the Board were divided. He was very sorry for it, but it was the fact; and therefore they must appeal to the shareholders to put them right. The report as originally drafted—he himself always drafted the reports—contained a clause about the matter, which read thus: "The Directors have carefully considered the question, and have decided, subject to the approval of the proprietors, to reintroduce the Bill next session." That was unquestionably his desire; for he believed that if they did not reintroduce the measure next session, their chance would be gone. They now had the "A" and the "B" stockholders together; and he thought they would be together for another year. But if they were to wait for a couple of years, it might be hopeless. His own feeling was that the Bill should be reintroduced next session; but a majority of the Board took the view that it should not be reintroduced, and said that "the Committee of the House of Commons having refused to sanction the conversion of the Company's stock from a nominal 10 per cent. into double the amount of 5 per cent. stock . . . the Directors think, looking to all the circumstances, it is not advisable to reintroduce their Private Bill." They did at last become unanimous as to the report which was issued, in which they said that they would leave it to the proprietors to express their opinion as to the expediency of reintroducing the Bill next session. He would now tell them what divided the Board. He wanted to have inserted in the Bill a proposal for extending the area of representation; and he had to ask the shareholders kindly to dismiss everything like prejudice, and to consider that they were all animated by a desire for what was for the good of the Company. At their last meeting, some little prejudice was created by a premature publication in a newspaper; but that feeling, he hoped, was past and gone. It was necessary that he should explain the matter rather fully. It had been the growth or development of some years. They began at the time of the strike with the profit-sharing arrangement, for the purpose of attaching their employees to them; and this measure had been admitted on all sides to have been very successful. But that was not sufficient. The men merely taking so much percentage on their wages year by year would do good in its way, but it did not go far enough—at any rate, not to his mind; and therefore they made an extension of the profit-sharing. They offered to increase the percentage on the wages, if the employees would consent that half of the annual bonus should be invested in the Company's stock. That was begun last year; and, as he had said, there was now something like £25,000 of the employees' money invested in the Company's stock. What followed from this? Where a man had his money, he had a right to a certain control over it. He was not going to say the employees' holding or possible holding for a good many years would be sufficient to give them a right, on a

strictly proportional basis, to representation on the Board; but it was sufficient to warrant something being done. The most important question, he thought, that affected them commercially and industrially, was that of reconciling capital and labour. If these at present antagonistic interests were not reconciled, it would be a bad day for England. Although apparent peace existed at the present time, there was a few years ago a violent attack on capital. This was dying out; but they might depend upon it that the time of trouble would come again, and what he and some of his colleagues wanted to see was that when that time did come (when times of prosperity returned, and labour thought it had its chance again), it should find them a perfectly united body—shareholders, directors, officers, and workpeople all united together to promote the good of the Company. To arrive at that point, however, it was necessary that they should show their confidence in their people; and he thought, too, that a step of this kind was necessary to combat "the advent of Socialism," which Herbert Spencer said, in a recent letter, "will be the greatest disaster the world has ever known." What they had to do, as employers of labour, was that which should tend to win their people from the side of the socialists to the side of those who were anxious to preserve all that was good in our system. It was not a new thing; it was brought to his notice when he was sitting on the Labour Commission three years ago; and the more he thought of it, the more convinced he was that it was a right and proper step—that it was unquestionably right that their employees, when they became large investors in the Company's stock, should have some representation on the Board. He might have known six months ago, but he knew it now, that the workman-director, as the JOURNAL OF GAS LIGHTING said, existed. The system had been tried for nine years by Mr. Thompson, of Huddersfield, who had sent him a letter in which he said that three of their men were on the board of management; and that, instead of causing any difficulty, they had helped make the thing go. Mr. Brownfield, of the Potteries, had converted his business into a Company, or co-operative guild, and had workmen-directors doing well. In London, there was a "Co-operative Lighterage Association," or Company; and they had two of the workmen on the Board of Directors. These men worked all the time when they were not attending the Board; and when they did attend the Board, they were paid a fee of 10s. each. He knew a good many of the labour leaders—some of the best, and some of the worst. Of the best, he could say that there were no men he more highly respected than some of them, whose desire was to bring capital and labour together to work harmoniously for one common good. As regarded the aim of the others, he would not say anything, except that their object was not, at any rate, for the benefit of capital. He had received the permission of the Duke of Devonshire to read his Grace's opinion. He sent the Duke a statement of what was proposed; and he replied: "I have read your memorandum with much interest, and can see nothing but advantage from a public point of view, if you are able to overcome the practical difficulties." Sir Michael Hicks-Beach (whose authority he had to make the statement) said: "My own feeling is that the fact of such a representative being in the Company's service, would make his presence on the Board rather more valuable than otherwise. I do not see how the contrary view could be maintained by anyone who approved of the principle of workmen being shareholders." Well, they had all approved of that. At the time their Bill was passing through Committee, the House of Commons itself was giving an expression of opinion on the subject of profit-sharing. Mr. Mundella moved an "Instruction" to the Committee that a clause should be inserted in the Bill authorizing the shareholders at the proper time to make arrangements for the election of workmen-directors. This "Instruction" was moved by Mr. Mundella, seconded by Sir Michael Hicks-Beach, and supported by Mr. Bryce. These three gentlemen had held the position of President of the Board of Trade. Mr. Mundella remarked—quoting from *The Times* report of the debate on the subject—"If this system of profit-sharing which Mr. Livesey advocated were adopted, he (Mr. Mundella) believed it would have the very best possible results when it came into operation." Sir Michael Hicks-Beach said that he "entirely agreed with the spirit which dictated this proposal. He thought they all felt that if some provision even of a tentative character were made for the representation of the workmen on the Board of Directors, it would be desirable; and any company which took the initiative in carrying out such a scheme, really would deserve well of those who desired to promote good social relations between the employers and the employed." Mr. Bryce said he "thought the object aimed at would command approval in every part of the House. He thought there was nothing more desirable than that the principle of profit-sharing should have a fair chance." That "Instruction" was passed unanimously by the House of Commons. He (Mr. Livesey) thought that what he had said justified bringing this matter forward. He liked Sir Michael Hicks-Beach's suggestion that the thing should be merely tentative. All he (the speaker) suggested was that they should have the restrictions removed which prevented them from doing this. If theirs was a private concern, not bound by Act of Parliament, and the Directors and shareholders thought it desirable that there should be this representation on the Board, they could act upon their feeling in the matter; but they were themselves fixed hard and fast by Parliament. They had seven Directors, each of whom must have a qualification of some thousands of pounds; and it was impossible to do anything in this direction unless the existing ties were relaxed. All he asked was that a clause should be inserted in the Bill giving the Company permissive powers; and when the workmen's investment had increased to, say, £50,000, the Directors should have authority to prepare a scheme to be submitted to the shareholders and approved by the Board of Trade, to enable the employees to select one or more representatives to sit on the Board and assist in the management of the Company. It was said that it would very likely not succeed. He did not believe that—he thought it would succeed; but to meet the fears of those who said it would not, the workmen's representative must have certain qualifications in the first place. They would not elect a man who came into the Company's employment yesterday. Just the same with ordinary Directors, they must have been shareholders for some time, and hold so much stock; and the same rule would be applied to the men. They must have been in the Company's service not less than seven years, and have invested (say) £100. At any rate, he would have it provided that the scheme should only be for three years. If it worked badly, it would then expire by effluxion of time; while if it worked satisfactorily, it could not go on without again receiving the consent of the shareholders and the approval of the Board of Trade. If the proprietors wanted the Bill to be passed, and wished him to help in passing it, this clause must go in; for in face of the "Instruction" of the House of Commons, and of the view he held, he would not be a party to reintroducing the Bill without it. He believed that in this matter, as in others, "faint heart never won fair lady." He held that labour was the "fair lady;" that she was worth winning; and if they could win her they would have a period of prosperity such as they had never known before. (Applause.) He had been the pilot of this concern since his father's death in the year 1871. The present was not the first time that they had had a divided Board. They had a difference over the sliding-scale; and the shareholders put the matter right. One Director retired, and another was elected in his place. They had a divided Board when the question of amalgamation came up—a question of vital importance to the old South Metropolitan Company. In this matter, again, the shareholders took the case in their own hands; and when the election of a certain Director came round, another was put in his place, and the amalgamation was the starting-point of the increased prosperity of the Company. So long as God gave him the ability, and he had the shareholders' confidence, he would serve the Company, not for the fees, but because he was proud of his connection with the Company. But at the first sign of failure of ability, or of want of confidence on their part, his resignation would be given. If they had confidence in him, they would express it at that meeting. If not, they would know what to do; and he would also know what to do. He concluded by moving the following resolution: "That the report and accounts now presented be received and adopted, and, with an instruction that the Bill be reintroduced next session, the report be entered on the minutes."

Mr. R. MORTON remarked that on several occasions he had seconded the adoption of the half-yearly report; but he never before rose with such a sense of responsibility as he did on the present occasion. He felt quite sure that the shareholders would agree with him that rarely, if ever, had the report and accounts been more satisfactory than those now submitted for their approval. He need not dwell on this, or say much more in addition to what the Chairman had said on the first part of the sixth paragraph. He thought the instruction to reintroduce the Bill for the consolidation and conversion of the stocks would be given unanimously. He was greatly impressed with the new departure which the Chairman had dwelt upon, not only in the advantage it would be to the undertaking in carrying out its varied operations—and he believed it would be of great advantage in that respect—but also in the justice and righteousness of the proposal as one for general adoption. He considered that, if it were anything like generally adopted, it would be the means of getting rid of a very large proportion, at all events, of those labour troubles to which the Chairman had referred, and make the working of joint-stock and private concerns more harmonious. It would also tend to elevate those in whom they were all interested. Moreover, he believed that if the shareholders gave an instruction for the introduction into the Bill of the labour-director clause, it would not only not militate against the passing of the other clauses of the Bill, but would greatly help them on. He had a profound conviction, from what passed when the Bill was before the Parliamentary Committee previously, that this would be the case.

Mr. HARRIS said he thought the resolution should be divided. He believed they would all agree in receiving and adopting the report; but there might not be agreement regarding the Bill.

The CHAIRMAN said there was no harm in separating the adoption of the report from the reintroduction of the Bill.

Mr. STOCK inquired if he gathered that the Bill was lost before because the clause approving workmen directors was not in.

The CHAIRMAN replied that in his opinion that was so.

Mr. STOCK said he regarded the proposal as a very good one; and he would support it to the utmost of his power. He thought the majority of those present would endorse the Chairman's opinion as to his knowledge of gas companies, and of the best way to work them. He considered that when the men had £50,000 invested in the Company, it would be a very proper sum for justifying them in having a representative on the Board.

Mr. FOSTER remarked that the Chairman had given this subject his attention for the last three years, and was still of the same opinion. They had followed their Chairman implicitly for many years. He had their entire confidence; and in the way in which he proposed that workmen directors should be appointed, he (the speaker) saw no objection whatever. He thought their great effort in these times must be to amalgamate the interests of capital and labour. They too often found these interests antagonistic; and if, by adopting the system recommended by the Chairman, they could do away with these difficulties, he said let them give it a fair trial. The Chairman had asked for three years; and he himself was quite sure that at the end of that time they would not want to discontinue it.

Mr. J. EWART said that at their last meeting the views of the majority of the Board were expressed somewhat late; and he thought they were under considerable disadvantage, perhaps, from that. He now proposed to say a few words in which he would endeavour to express the views of the majority of the Board. They were extremely sorry, of course, that the question had come to this point; and he might say, personally, that the majority of the Board were still more sorry that the Chairman had put the matter to the shareholders in the form he had done. It seemed to him that it was not a question of such vital importance, as the Chairman had said, as to amount to a vote of want of confidence if the proposal was rejected. To his mind, this was putting rather a severe strain on the loyalty of the shareholders. They were adopting a very unusual course. In all companies, as a rule, the opinion of the majority certainly guided the policy of the Board, and these questions were not brought before shareholders; and shareholders might very fairly say, as one of them said to him after their last meeting, "You are paid as Directors to settle these questions among yourselves. I do not know why you should appeal to us when you are in a better position to form an

opinion than we are." As the Chairman had said, the matter had come to rather a critical point among them; and it seemed best that the shareholders should settle which course they preferred to follow. As regarded what had taken place since their last meeting, the Chairman had told them what his view was of what took place before Parliament. With respect to the "Instruction" of which the Chairman had spoken, he himself differed very strongly from Mr. Livesey regarding the importance he attached to this matter; and he believed that, when he explained the circumstances as they were within his knowledge, the proprietors would agree with him. This "Instruction" of Mr. Mundella was only put on the paper the day before the motion was brought forward. This was on a Wednesday, when the House met at twelve o'clock. Therefore members of Parliament were only in receipt that day of the information that there would be such a motion. He heard of it a little after eleven o'clock; and Parliament was to meet at twelve. He immediately went about to see various members he knew, to ask them to go to the House to oppose the motion. but there was no time. It was a surprise motion, and did not express in any way, to his mind, the intelligent view of the House; and he might also say that the House as constituted now was a very different body from what it was at that time. They also differed very strongly from the Chairman as to the question of the representation of the workmen. The Bill expressly provided, as he said at the last meeting, that the voting qualification should be very materially reduced, and at the same time the voting power be substantially increased; and in that way the workmen shareholders, like all the other shareholders, were amply protected. Besides that, there was this further difficulty—that with this special qualification they would also be qualified to vote for ordinary directors, and therefore they would be entitled to double votes—[The CHAIRMAN: Certainly not]—unless some special provision was made for that, of which they had not heard. The instances the Chairman had mentioned—of three or four companies where this system of workmen directors had been introduced—really did not bear much on their position. These were quite small companies, with a very small number of proprietors. In one case, the family held nearly all the shares; and if any disaster should happen from this arrangement not being a success, no great harm would follow. Theirs, however, was a very important concern, with between 5000 and 6000 shareholders, many of them ladies and people in moderate circumstances; and therefore, if this scheme did not succeed, they would suffer very much. Beyond that, the Directors had a responsibility to the public; and the consumers would also be adversely affected by anything that caused the Company to increase the price of gas. His colleagues at the Board for whom he was speaking and himself saw no reason to change their views since their meeting in the spring of this year. As he had said, the "Instruction" of the House of Commons was not of the importance attached to it by the Chairman. The various gentlemen the Chairman had quoted had had opportunities themselves of introducing this form of representation on Boards with which they were connected; and they had not done so. It was the old story of the cat, the monkey, and the chestnuts. They would be very glad to see this scheme adopted by someone else, and prove a success; and, if so, it might be time enough for this Company to adopt it. Moreover, there was no desire on the part of the men, as far as they could ascertain, to be represented on the Board in the manner suggested. One would have thought that since the last meeting, the Directors would have received some expression of opinion from the men on the subject; but this had not been the case. There had been no meeting of the men, no representations, no petition, no anonymous letters of any kind, saying that the Directors were doing the men any injustice. On the contrary, from information he had, they took no interest in the matter; and the very few who did were rather puzzled than anything else about it. It seemed to the majority of the Board that the whole thing was premature; and it could not take effect for a number of years, when circumstances might be completely changed. On every ground, it seemed to them that it was extremely undesirable to adopt such a proposal.

Mr. SIMPSON ROSTRON remarked that he was unfortunately not able to be present at the last meeting, as he had been ordered abroad by his doctor. They might therefore expect him to make a few remarks on this very important question. As to the consolidation and commutation of the "A," "B," and "C" stocks into a 5 per cent. stock, he supposed that none would doubt the advantage of the proceeding. Their only difference was whether the Bill for this purpose should have clauses enabling the Directors, after the aggregate amount of stock held by the Company's workmen had reached a certain sum, to take steps, with the approval of the Board of Trade, to secure the appointment of a workman director, and whether such appointment would be of advantage to the Company. In his opinion, the proposal was neither so new nor so startling as it at first sight might appear. It was the outcome and development of the root idea of the sliding-scale principle. Having referred to the origin of the sliding-scale, and alluded to its successful working, he stated that, when the amalgamations were carried out and the Greenwich works completed, and the new capital began to be remunerative, Mr. Livesey (who meanwhile had become their Chairman) once more turned his attention to the reduction of the price of gas. To get below a certain figure was not always easy; and to give a larger dividend with what might be a less revenue was like burning the candle at both ends. A larger dividend did not come automatically with a reduction in price; and the Company's business, therefore, needed pushing and greater exertions in order to obtain the necessary increased consumption. With this object, Mr. Livesey proposed—and the Board adopted his proposal—that a bonus should be given to the staff, if by their exertions the increased dividend was earned. The plan worked well; and then it was that this principle of identity of interest was developed another stage in the Chairman's mind by his bringing forward the profit-sharing scheme. Part of the bonus had for some time been invested in the Company's stock; and he had never concealed from himself that, if they had workmen shareholders, it was only a question of time when there must be a workman representative on the Board. To his mind, this was the logical result. He desired to notice an objection which had been urged, which at first he had felt disposed to admit, and which, so far as he knew, was the only one involving a principle—the other objections being rather suggested by timidity or feeling than based on principle. It had been said: "You propose a special representation; and all special representation is bad. Are not these workmen shareholders represented by the Board, like the other ordinary shareholders?" Now, this was one of those half-truths which were proverbially dangerous; for though, of course, the Directors represented every shareholder, it left out of sight the fact that the workmen were not ordinary shareholders. They could not go and buy the stock when the market was low, like ordinary shareholders, but must take it at the price of the day. It was a condition of the profit-sharing scheme that they should do so. They were a creation of the Company's action; and, as such, they were entitled, under proper regulations, to representation. Sectional representation of part of a class who were on "all fours" was bad; but special representation in certain circumstances was another thing. And this was already acted on in some companies. The scheme was optional, not compulsory. It was not to come into operation until the men's holding amounted to a large sum. No one could be eligible for election to the Board unless he had been seven years in the Company's service, and had had for twelve months previously what, for him, was a large amount of stock. No one would be allowed to canvass; and the duration of the scheme was limited. If not found satisfactory, it need not be renewed. Finally, the whole scheme was subject to the approval of the Board of Trade. Was the proposal, after all, so great a departure? Was it not much less so than that of 1876? The object of the proposal was to establish and strengthen the good relations now existing between the Company and their workmen. It was to encourage the workman to take an interest in his work, giving him the powerful motive of self-interest. Another object was to make the workman acquainted and familiar with the considerations and responsibilities of management and policy—in short, to enable him to see through the Directors' spectacles, and to consider what were the interests of the Company in its corporate capacity, taken as a whole, and also to render the other Directors more familiar with the feelings of the workmen and with the details of every-day work, as well as to receive hints and suggestions, which might be of practical value. In brief, it was to bring employers and employed closer together; and if it were successful, the Company would be immensely strengthened. There might be at first some little difficulties. What, however, he ventured to think would determine their vote that day, was the recollection that the proposal was brought forward, and if adopted would be carried out, by one in whom they had faith and confidence. Mr. Livesey accepted the responsibility of recommending it, for he believed in its success; and he might inform them that their Chairman was by far the largest shareholder in the Company. This was not either the first or second occasion when another step forward by Mr. Livesey had been objected to by some of his gas friends. In 1875, in his (the speaker's) judgment, Mr. Livesey took a stronger course than now. His advocacy of the sliding-scale, and with it the willingness to surrender the shareholders' right to all new capital at par, and of a certain 10 per cent. dividend secured by the revision clauses, was the occasion of his being disapproved of by one important member of his Board, who shook his head and declared that the Company's position was being endangered—that the public would never consent to higher dividends than 10 per cent.; and in Mr. Forster's Committee, the Counsel for the Gas Companies called him "Queen's Evidence" and "a traitor to his cause." But Mr. Livesey was not frightened; he persevered, and what had been the result? Larger dividends had been declared and acquiesced in, and the gas world had had peace for twenty years. Again, he had strong opposition when he proposed amalgamation; and recently, when profit-sharing was first started, there were friends who said: "Wait until you are forced to put up the price, and then you will see." Well, the price was later on put up, and the bonus was reduced; but nothing happened. On each of these occasions, after-events had justified the Chairman's action; and so he believed the objections or fears on the present occasion would prove to be groundless. Mr. Livesey and himself regretted that some of their colleagues differed from them; and therefore the question had been laid before the proprietors for their decision. Mr. Livesey believed that the inclusion of this permissive scheme would help to pass the Bill. He agreed with the Chairman; and he believed that the adoption of the scheme at the proper time would broaden and deepen the foundations of the Company. He asked the shareholders to adopt the principle, and so show their confidence in the ability of the man who had made their Company the first of its kind.

Mr. E. H. CARDWELL asked the meeting carefully to consider the use of obtaining parliamentary authority to make a great change in the constitution of the Board some years in advance of the time when that change could be carried into effect. He could not see, when they were anxious to make this change in the representation at the Board of some of the shareholders, what the difficulty would be in going to Parliament for a short Act, which would deal with this question, and it only. He thought the question should be dealt with quite separately. It was a very important one, and they had not had much time to consider it, and, moreover, they had not heard all the arguments against it.

Mr. DONKIN inquired whether he understood correctly that, if the scheme went forward, it would only last for three years, when they would be asked for another vote on the subject.

The CHAIRMAN replied in the affirmative.

Mr. DONKIN expressed his pleasure at seeing that the reserve fund had been so largely increased, and said he hoped the Directors would year by year see their way to augment it.

Mr. CARDWELL desired to add that, when parliamentary authority had once been obtained, although the scheme might, in a certain sense, cease on a certain day, yet that parliamentary authority would not be withdrawn; and there was no doubt in his mind that efforts would be made by persons altogether outside the Company, and not in any way responsible for its management, to induce them to bring on the scheme again.

Mr. HOGARTH said he had listened attentively to the remarks which had been made respecting the proposal; and having seen how it had acted elsewhere, he could assure them that he had never found a single

instance of failure. It had produced harmony, and had furthered the interests of any company that had adopted it.

A SHAREHOLDER, whose name did not transpire, said he most heartily supported the motion both for the adoption of the report and the instruction.

Mr. GRICE inquired how many employees of the Company were now shareholders.

The CHAIRMAN: Over 2000. Continuing, he remarked that it was a perfect illusion to say that, by reducing the voting qualification, the employees' position would be strengthened. The Board, for many years, could out-vote the whole of them. It was not necessary for him to go through his notes in order to reply to Mr. Ewart, who had said nothing practically against the proposal. If those who were opposed to his views would suggest some better plan, or show how the object could be better attained, he would be the first to listen to it. He then put the motion as he originally proposed it; adding that he might divide it to suit Mr. Harris, but this was the form in which the Board agreed that it should be put to the meeting.

The resolution was then carried, with not more than half-a-dozen dissentients in all.

The CHAIRMAN thanked the meeting, and remarked that their vote was the best answer to what had been said.

The DEPUTY-CHAIRMAN (Captain T. B. Heathorn, R.A.) then proposed the following resolution: "That a dividend at the rate of 13 per cent. per annum be now declared, and that such dividend, with the exception of the sum of £500, be apportioned amongst the three classes of stock as prescribed by the Scheme of Amalgamation, 1880; and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. ROSTRON seconded the motion, which was carried unanimously.

A resolution was afterwards proposed electing Mr. G. M. Footner an Auditor, in the place of Mr. A. Footner, deceased; and a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in reply, stated that he rose on that occasion with peculiar pleasure, to thank them for their vote; and he was glad to think he could do so for his colleagues as well as for himself. There had been divisions of opinion among them; but he hoped that the meeting had settled them. He trusted now that they would be a united Board, as they had heretofore been, for a disunited Board was simply intolerable. The object of all of them was to do what they considered best for the interests of the Company. Their interest was with the Company; and they intended to do the best for the Company in the future, as they had done in the past. He could not conclude without recognizing the admirable services which were rendered to the Company by their officers. His brother, the Engineer, was head of one department, and Mr. Bush was head of another. Both these gentlemen had the deepest interest in the Company, for which they were doing their best, as were also the officers and workmen who were under them. He would not say that every man did his best, because there were some who took no interest in anything. They were, however, finding out who these were. But on the whole, he thought they were served by a thoroughly good set of officers and workmen.

Mr. ROSTRON seconded the motion, which was carried unanimously.

The CHIEF ENGINEER (Mr. Frank Livesey), in acknowledging the vote, stated that one of the Directors had reminded him that their leakage looked rather heavy; but it was not really so.

The CHAIRMAN: It is under 5 per cent.

The CHIEF ENGINEER, continuing, stated that there was also so much gas now used in the daytime that they had to give a much heavier pressure. The works were being maintained in the most efficient condition; as they desired to conduct the business of the Company in the most economical way.

The SECRETARY also replied, remarking that it was a source of great gratification to the officers to think that they had been able to get the price down again to the old figure of 2s. 3d. He did not know whether they would ever reach the ideal figure of 2s., which had been so often talked about; but they would try for it.

The proceedings then terminated.

Plymouth Corporation Water Supply.—The Consulting Engineer to the Plymouth Corporation (Mr. James Mansergh, M.Inst.C.E.) and their Water Engineer (Mr. E. Sandeman) have just presented to the Town Council a report on the condition of the works at the Burrator reservoir up to the end of June, with an accompanying statement of expenditure. The Engineers repeat what they previously said—that at Burrator the cost would probably not exceed the estimate, but that at Sheepstor it would do so. This, however, is regarded as being relatively an unimportant part of the work. The quantity of material taken out of the Burrator dam was 25,070 cubic yards; and that taken from Sheepstor dam, 8041 cubic yards, as against 7000 yards in the estimate. The total amount spent on the reservoir since the commencement of the works has been £25,160 12s. 1d. The preliminary work of clearing the site, trial pits, &c., cost £610. The expenditure on plant has been £6506, and on workmen's dwellings, sheds, stores, offices, cottage, magazine, stables, and water supply, £2251; while the cost of the works connected with the diversion of the river has been £929. After charging to the Burrator dam the wages, salaries, cost of pumping in full, and making a proportionate charge for plant and the auxiliary works, the cost of the excavation amounts to £8487. From this amount, the value of the rock suitable for building—about 10,000 cubic yards, worth £4000—may be deducted. When this is done, the cost per cubic yard of the excavation works out to 3s. 7d., as compared with 4s. in the estimate. Owing to the great depth to which the Sheepstor trench has been taken, and the large quantity which it has been necessary to pump, the cost of the work there has been much in excess of the estimate. The total amount chargeable to this dam is £3990; and the cost of the excavation per cubic yard has been 8s. 11½d., or 8s. 6½d. after making allowance for the excavated rock. This stands against 3s. in the estimate. A very serious item of cost in this trench has been the timbering necessitated by the greatly increased depth to which it has been necessary to go on account of the pervious vertical veins. Upon this, £2268 has been spent.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Report and Accounts.

The report of the Directors of the above-named Company, with the accounts for the six months ending June 30 last, has been issued in view of the ordinary general meeting next Friday. The Directors report with pleasure that there was a large increase of business during the half year, to a considerable extent due to the prolonged and severe frost in January and February; but, beyond this, the increase in the second quarter was at a very satisfactory rate. This enabled the Company to meet the very considerable fall in the value of coke and ammonia, and to present accounts which show that the full dividend of 5¾ per cent., to which, under the sliding-scale, the shareholders are entitled, has been earned. The price of coal, which last year was forced to a figure above its market value by a combination of the coal-owners, has, on the collapse of that combination, fallen perhaps to a lower point than it would otherwise have reached. The Directors have consequently made their new contracts at an appreciable reduction. The benefit of this, however, was not felt in the past half year. It will now assist in meeting the depreciation in the value of coke and ammonia; and it also enables the Directors to make a reduction of 1d. in the price of gas, which from the June quarter will be 2s. 7d. per 1000 cubic feet. There is no falling off in the demand for automatic meters. The Directors state that the profit-sharing system started last year is working satisfactorily with the Company's officers and workmen. Many of them are becoming shareholders; and they have deposited with the Company at interest the large sum of £4107 5s. 7d. This, they remark, is satisfactory evidence of confidence in their employers. The Directors recommend dividends at the following rates per annum: 5 per cent. on the preference stock, and 5¾ per cent. on the ordinary stock—amounting, inclusive of income-tax, to £15,543 15s. There will remain a small surplus to be added to the undivided balance, which will then amount to £5349 1s. 7d., to be carried forward. The Directors recommend an addition of £50 per annum to the Secretary's (Mr. Charles M. Ohren's) salary from the 1st of January last.

The accounts accompanying the report show that a sum of £4996 was expended on capital account in the six months ending June 30 last. Of this, £1621 was for buildings and plant, £1535 for new meters and fixing, £1181 for new gas-stoves; and the remainder for new mains, services, and lamps. The total capital expenditure was brought up to £633,399; leaving a balance of £28,994 still available out of the £662,393 called up. The total gas-rental in the half year amounted to £64,266; the rental of meters (12,458 ordinary, and 2316 automatic), to £1025; the rental of stoves (3516 ordinary, and 1416 automatic), to £505—together, £1530; residuals, to £18,855; and the total receipts, to £84,683. The expenditure on the manufacture of gas came to £54,166, of which £35,563 was for coals; on its distribution, to £5683; management cost £2969; and the total expenses were £67,671—leaving a balance of £17,012. The amount available for division is £20,892. The works, under the supervision of Mr. Charles Gandon, M.Inst.C.E., produced in the past half year 501,740,000 cubic feet of gas, of which 484,533,550 cubic feet were accounted for. There were 48,638 tons of coal, 1691 tons of cannel, and 37,045 gallons of carburine employed in the manufacture of gas; the estimated production of residuals being: Coke, 603,960 cwt.; breeze, 3729 yards (78,309 bushels); tar, 498,745 gallons; and ammoniacal liquor, 9320 butts. There were 424 tons of sulphate of ammonia made; making, with the 150 tons in store, 574 tons, of which 534 tons were sold.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The accounts of the Bridport Gas Company, Limited, for the year ending June 30, which will be presented at the ordinary general meeting to-day, show that the profit for the twelve months was £820, as compared with £1218 in the previous year. The revenue from the sale of gas fell off by about £250, owing to the reduction of 5d. per 1000 cubic feet in the price; and the cost of coal was higher by about £100. The Directors, however, will recommend a dividend of 8 per cent. per annum, free of income-tax, on the ordinary shares, and of 5 per cent., less income-tax, on the preference shares; leaving a balance of £429 to be carried forward. They consider the result of the year's working, on the whole, very satisfactory. They refer with regret to the death of their Secretary and Manager (Mr. T. Giles), and record the appointment of Mr. J. H. Cornish as his successor.

The Bristol Gas Company will hold their half-yearly meeting next Friday, when the Directors will have good cause to congratulate the shareholders on the continued prosperity of the undertaking. Notwithstanding the reduction, in July last year, of 2d. per 1000 cubic feet in the price of gas, the revenue account shows a balance of profit, after paying interest on the debenture stock and the dividend on the ordinary shares, of £11,326; and a further reduction of 2d. has been made as from the 1st ult. The Directors will recommend a dividend at the rate of 5 per cent. per annum on the nominal capital of the Company. The accounts for the six months ending June 30 show that the sale of gas to private consumers produced £90,888, as compared with £89,150 in the corresponding period of 1894; that sold for public lighting and under contracts, £12,471, as compared with £12,921; rental of meters and stoves, £2281, against £2127; residuals, £27,410, against £27,974—the total receipts being £133,314, compared with £132,421. On the expenditure side of the revenue account, we find that the manufacture of gas cost £76,705, against £76,414 in the first half of 1894; distribution, £4507, against £3814; and management, £4864, against £4799—the total expenditure being £94,083, as compared with £92,314. The balance carried to the profit and loss account is £39,231; while at the corresponding period last year, it was £40,107. In the manufacture of gas, 83,521 tons of coal and 5394 tons of cannel were carbonized or used in the past half year. The residuals produced are estimated as follows: Ordinary coke, 52,422 tons; cannel coke, 2893 tons; breeze, 7371 tons; tar, 897,258 gallons; and ammoniacal liquor, 1,916,257 gallons.

The 54th half-yearly meeting of the Calverley and Horsforth District Gas Company was held last Wednesday. Mr. W. Turton presided, and stated that the receipts during the six months ending June 30 amounted to £4351, and the total expenditure to £3079; leaving a balance of £1271. This added to the balance brought forward, showed a net sum of £2906 available for division. To pay dividends at the rate of 10 per cent. on the original, and 7 per cent. on the new stock, would absorb £1434; leaving £1472 to carry forward. A total of 23,826,900 cubic feet of gas were sold during the half year. The report was adopted, and the dividends declared.

The half-yearly general meeting of the Newport (Mon.) Gas Company was held on Monday last week, under the presidency of Mr. E. J. Phillips, J.P. The report presented by the Directors showed that the earnings for the past year had been £22,779, of which a sum of £5784 was available for division; and they recommended the payment of the maximum dividends at the rates of 10, 7½, 7, and 5 per cent. per annum on the various classes of stock. In moving the adoption of the report, the Chairman said it was very gratifying to the Directors that they were able to pay the full dividends without in any way encroaching upon the reserve funds. There had been a small outlay of £252 on capital account for new mains. Altogether, during the half year, 1945 yards, or a little more than a mile, of new pipes had been laid. The Company had sold more gas—realizing £16,411—than during the corresponding half of 1894. The additional quantity of gas made was 12 million cubic feet, or at the rate of 9 per cent., as compared with 7 per cent. in the first half of 1894. This was owing to the past severe winter, which necessitated more lighting and heating in houses. Altogether, they might congratulate themselves upon the excellent position occupied by the Company. There had been a steady increase in the number of gas fires and cookers put into houses. He did not think there was any cause for alarm from the competition of the electric light, because, though considerable strides were being made with that illuminant, great improvements had been effected in connection with incandescent gas lighting, which undoubtedly was more efficient for indoor use than the more extravagant electric light. In conclusion, he acknowledged the steady and ready assistance the officials had always rendered in carrying on the Company's business. The report was adopted, and the dividends recommended were declared. The usual complimentary votes were acknowledged by the Chairman, the Secretary (Mr. E. F. Marfleet), and the Engineer (Mr. T. Canning).

The report which the Directors of the Reading Gas Company will present to the shareholders at their meeting to-day is a very satisfactory one. During the half year ending June 30, they found they were justified in reducing the price of gas; and as from the end of March a concession of 2d. per 1000 cubic feet was made to all consumers. The whole of the works, which are under the supervision of Mr. E. Baker, Assoc.M.Inst.C.E., have been maintained in the highest efficiency; and favourable contracts have been entered into for the supply of coal and the sale of tar. While the reduction in price will probably lead to an extended use of gas by private consumers (the demand for cooking-stoves having markedly increased since the exhibition held in May last), the Company still retain the public lighting—their contract with the Corporation having been renewed for a period of five years. The accounts accompanying the report show that £22,456 was received for gas sold, £6763 for residuals, and £69 on stove account; making a total of £29,288. On the other hand, the manufacture of gas cost £17,988 (£12,979 being for coals); its distribution, £2770; and management, £1091—the total expenditure being £24,053. The balance carried to the profit and loss account is £5235; and the amount available for division, £16,291. Out of this, the Directors recommend the payment of the full dividends upon all the stocks and shares of the Company. The quantity of mixed coal carbonized or used in the half year was 14,804 tons; and of the gas produced and in store, 140,430,700 cubic feet were sold within the borough; 3,799,400 cubic feet outside; and an estimated quantity of 9,497,697 cubic feet used for public lighting and under contracts. With regard to residuals, the production of coke was 14,804 chaldrons; of tar, 168,306 gallons; and of sulphate of ammonia, 132 tons 4 cwt.

Water Companies.

The Chester Water Company held their 77th half-yearly meeting on the 8th inst.—Mr. W. Brown in the chair. The Engineer (Mr. G. Crowe) reported that the rearrangement of the first and second filter-beds was completed; and the latter commenced to work on the 24th of April, giving every satisfaction. The mains so extensively damaged by the exceptional frost of last winter had all been renewed. The accounts for the half year showed a surplus of revenue over expenditure of £2843. Adding the balance brought forward—£6083—made £8926. The interest on the preference capital required £450; leaving a balance of £8476. The report of the Directors and the accounts were adopted. The following dividends were then declared for the half year: 7½ per cent. per annum on the consolidated stock; 6 per cent. upon the perpetual and 6 per cent. preference shares; 7 per cent. upon the amount paid and entitled to dividend on the new ordinary stock, 1874; and 4 per cent. on the amount of calls paid in advance on the second moiety of such new stock.

The Directors of the East Worcestershire Water Company report that, during the half year ended the 30th of June last, additional services were laid on to 93 premises; making the total 3770, exclusive of Droitwich and Rednal. The yield from the well averaged 517,519 gallons daily; but, in addition to this, for some weeks after the frost, and subsequently for a fortnight during the drought, a considerable quantity, estimated at more than 100,000 gallons daily, was obtained from a bore-hole by temporary pumping machinery, which enabled the supply to the whole district to be maintained. The half year commenced with a frost which, for duration and severity, has seldom been equalled in this country. A considerable number of service-pipes were frozen, and the mains also suffered in several places. Following upon the frost came nearly three months' unusually dry weather; and the demand for water was so excessive that recourse was again had to auxiliary pumping. The total cost of repairs to the mains, distribution of water by cart, and extra pumping during the frost, was £367 12s. 3d., which, being of so exceptional a nature, the Directors decided to enter separately in the revenue account. The profit, after providing for this charge, was £776, which, added to £1689 brought forward, makes a disposable balance of £2466. It is proposed to pay a dividend for the twelve months of 2½ per cent., amounting to £1533; to add £605 to the depreciation and reserve fund; and to carry forward the balance of £328.

In moving the adoption of the Directors' report at the half-yearly meeting of the Stockport Water Company on the 7th inst., the Chairman (Mr. G. H. Hill) stated that during the six months covered by that document the receipts had increased by £771, as compared with the corresponding half year of 1894. The expenditure had also increased by £712, as compared with the expenditure in the corresponding period. The latter was largely due to the severe frost of the months of January and February, which caused the water supplies throughout the whole of the district, and even as far south as London, to be greatly affected. The frost involved an outlay of about £800; but, in consequence of the increased revenue, the Company were able not only to pay their way, but to declare a dividend of 6¼ per cent., and carry forward a larger balance than before. The balance at the close of the previous half year was £206; now they carried forward £514. The additional balance would enable them to cope with any extraordinary expenditure which might be incurred. On the whole, the Company had had a very good half year, especially when they considered the extra outlay caused by the frost, and bore in mind the fact that the frost was followed by a drought which lasted until the end of June. Referring to the well at Wilmslow, the outlay there would, he said, be a little more than £5000, of which £3000 had already been paid. The work would be completed in about two months. It was estimated that the yield would be between 700,000 and 800,000 gallons a day; and the water was excellent. The report was adopted. The Chairman proposed that a dividend o 6¼ per cent. per annum be declared on the ordinary stocks, and o 2½ and 2¼ per cent. per annum on the 5 and 4½ per cent. preferentia stocks respectively; and this was agreed to.

THE GAS-COAL CONTRACTS OF THE OLDHAM CORPORATION.

At the Meeting of the Gas Committee of the Oldham Corporation on the 10th ult., a long discussion took place on the subject of the coal contracts, which, it may be remembered, had been investigated by a Sub-Committee. The outcome of it was that the Committee decided, as already recorded (*ante*, p. 188), to place with the Chamber Colliery Company a contract for 20,000 tons of coal at 8s. 9d. per ton. This came up for confirmation in the minutes presented at the last meeting of the County Borough Council. But the Chairman of the Committee (Alderman Smith) moved that this part of them should not be confirmed, as he believed the resolution had been passed under a misapprehension. He said he had no feeling whatever in regard to the people who were connected with the Company concerned; but within the last few months he considered their terms were wide of the mark, seeing that he could get coal from Wigan through a local agent at a reduction of 1s. a ton, whereas the Company had only made a concession of 3d. per ton. If they had allowed the same percentage as the Wigan people, their price would have been 8s. 2d. instead of 8s. 9d. per ton. The Manager (Mr. John Chadwick), after making tests, considered the Hyde Lane coal at 8s. a ton was better than the Chamber Company's coal. Why did the Company stand out for full prices? It was either because they had plenty of orders on their books or were able to hold their stocks. He maintained that it was not right to pay 9d. a ton more for an inferior quality of coal. It simply meant £750 taken out of the ratepayers' pockets, and put into the pockets of a wealthy Company. But there was something more than that. Oldham had a monopoly of the supply of gas to the out-townships; and this question would affect those townships to a great extent. In 1886, the Local Authorities, which paid one-third of the receipts of the Corporation gas plant and did not derive a penny in the shape of profit, tried to get powers to make their own gas; and if the present resolution of the Gas Committee were passed, they would hear of it again another day to their sorrow. In their own business, it would not take them two minutes to decide in favour of the lower tender; and he certainly believed that to place this contract with the Chamber Company would be to their disadvantage. The motion having been seconded, Mr. Shaw moved an amendment that the minutes be confirmed in their entirety. He said that since he was placed on the Gas Committee he had had many opportunities of investigating the coal question. He maintained that the figures he had previously given were correct, and showed that the Chamber Company's coal was the best in the long run. Mr. Hollingworth seconded the amendment. Alderman Jackson remarked that if Mr. Shaw and Mr. Hollingworth would move to the effect that the coal at 8s. 9d. per ton was better than that offered to the Council for 8s., it would simplify matters. Mr. Harrop stated that, if fairly reckoned up, the Corporation would lose £1000 if they placed the contract with the Chamber Company. Alderman Hood said what the Council wanted to know was whether the coal at 8s. was equal to that at 8s. 9d.; and neither the mover nor the seconder of the amendment had proved it to be otherwise. He said the matter had assumed a party character; and he contended that it would prove in the long run to be a very serious thing for the Corporation and the town generally if they began placing their contracts on party lines. He hoped the Council would make a bold stand against it. The pointed remarks of the Chairman of the Gas Committee ought, he said, to weigh with them on this question. Alderman Jackson said if it could be proved that the coal of the Chamber Company was superior to that at 8s. per ton, the matter would be settled. Mr. Hollingworth asked for the result of the analysis of the Hyde Lane coal. Alderman Smith said the relative tests made in May last gave an illuminating power in pounds of sperm of 686 for the Hyde Lane coal, as against 618 for the Chamber Company's coal; or an advantage to the former of nearly 10 per cent. Mr. Hollingworth said the three great points in the value of gas coal were the gas-producing power per ton, the illuminating power of the gas in candles, and the illuminating power in pounds of sperm. In 1888, the Chamber Company's coal, as tested by the Gas Manager, showed

738 lbs. The Mayor (Alderman Whittaker) remarked that, after all, the question was not so much one of price as of quality. It had been said that it was not disputed that the Hyde Lane coal was better than the Chamber Company's coal. But this had been disputed, and by gentlemen quite as worthy of confidence as those who had made these remarks. The fact was they had not had this coal for years. A test of one small waggon was no proof that the general body of coal was better; and they, as business men, would be surprised if the firm did not send their best coal for a sample. Alderman Smith, in reply, said he thought members of the Gas Committee who voted for the resolution in Committee, thinking that by so doing they were keeping the work in Oldham, were under a misapprehension. If the Chamber Company wished to have their coal tested, there were many gas-works in the country where the managers were allowed to test coal; and they could then have a practical test, which would be more valuable than any laboratory one. The future of the gas undertaking rested with the Council. He alluded to the deputation from the out-districts that had waited upon the Gas Committee that afternoon, and remarked that he was sure the question of price and the treatment of those districts would not rest where it was. A vote by show of hands was then taken; but the result was disputed. The names were then taken, and the amendment was declared carried. On it being put as a substantive motion, the following amendment was submitted: "That the resolutions referring to an independent analysis and the placing of the contract with the Chamber Colliery Company be omitted." When this was put, there voted for it 19. On the hands being again counted, there were found to be only 18; whereupon the Mayor said, "I will vote," and put up his hand. He was about to give his casting vote, when Alderman Brierley protested against the Mayor's action; and the amendment was again put. It was now defeated by 20 votes to 19; and the minutes were passed in their entirety.

THE OIL-GAS EXPERIMENTS AT BRADFORD.

We take the following from the *Bradford Observer* of the 14th inst.: "The two experts engaged to report upon Dr. Dvorkovitz's oil-gas process for enriching coal gas at the Thornton Road station of the Bradford Corporation Gas-Works, have just sent in their reports. Mr. Lewis T. Wright was the expert on behalf of the Bradford Corporation; and Mr. Thomas Newbigging, of Manchester, the expert acting for Mr. Isaac Smith. The effect of Mr. Wright's report is that the cost of enrichment to the extent of 1-candle power per 100 cubic feet of gas would be 0·76d. In the trials, 433 gallons of oil were used; and the cost he put down at 3·8d. per gallon. In his calculation, he reckons the value of the bye-products at 1·71d. per gallon. Mr. Newbigging puts the cost of enrichment, not at 0·76d., but at 0·36d. The difference between the two is accounted for by the first cost of the oil and the estimated value of the bye-products. Mr. Newbigging reckons the cost of the oil at 3¼d. per gallon, against 3·8d. by Mr. Wright; and this price is arrived at from the fact that the oil can be laid down in any port in England at 2⅞d. per gallon—leaving a margin of ⅜d. per gallon for bringing oil from the port to Bradford. Mr. Wright's calculation as to the cost of oil is made upon the cost of small quantities obtained for testing purposes; while Mr. Newbigging's is calculated on larger quantities, which can be contracted for. In Mr. Wright's calculation, the bye-products are reckoned at 1·71d. per gallon; this value being obtained by using the products for carburetting purposes. Mr. Newbigging, however, reckons the value of the products at 4·69d. per gallon; explaining that he has had the products analyzed by the Chemist to an eminent firm of tar distillers in Manchester, who gives 4·69d. per gallon as their commercial value. Taking the quantity of gas made by the Bradford Corporation, which amounts to 1500 million cubic feet per year, and reckoning the cost of enrichment from 16 to 18 candles at 1d. per candle, which is the acknowledged cost of enrichment, we arrive at the total cost of enrichment as £12,500 per annum. The same quantity of gas could be enriched by Dr. Dvorkovitz's process, according to Mr. Newbigging's report, at a cost of £4687 10s.; showing a saving of £7812 10s. per year, if this process were used in each of the Corporation's works. According to Mr. Wright's figures, which show a cost of practically ¾d. per 1000 cubic feet per candle for enrichment, there would still be a saving of £3125 per annum. The total cost of laying down a complete plant at all the gas-works would not exceed £3000."

Reduction in Price.—As mentioned in the report which appears in another column, the Directors of the Crystal Palace District Gas Company have reduced the price of gas 1d. per 1000 cubic feet (making it 2s. 7d.) as from the June quarter.

New Joint Stock Companies.—The Dunmow Gas Company, which was originally constituted by a trust deed in 1837, has been registered, under the Limited Liability Acts, with a capital of £3370, in £10 shares, all of which are taken up. The Helsby and District Water Company, with a capital of £5000, in £1 shares, is to supply the townships of Helsby and Alvanley, in Cheshire, with water.

Barnet District Gas and Water Company.—The result of the working of this Company in the six months ending June 30 last is a balance of £15,056, out of which the Directors will recommend, at the half-yearly meeting of the shareholders on the 30th inst., the payment of dividends (less income-tax) at the rates of 9, 8, and £6 6s. per cent. per annum on the various classes of stock. The revenue from the supply of gas and the sale of residual products amounted to £9155; the expenditure on gas account, to £6311—leaving a balance of £2844. The sale of water produced £8866; the expenditure on this account being £4029—leaving a balance of £4837. There were 3803 tons of coal carbonized; and 40,314,000 cubic feet of gas produced, of which 36,961,000 are accounted for. The residuals are estimated as follows: Coke, 3614 chaldrons; breeze, 244 chaldrons; tar, 43,642 gallons; and sulphate of ammonia, 17½ tons.

ELECTRIC LIGHTING NOTES.

In the Court of Appeal on the 10th inst., the Master of the Rolls and Lords Justices Kay and A. L. Smith had before them an appeal from the decision of Mr. Baron Pollock and Mr. Justice Wright on the special case stated in the action brought by the British Insulated Wire Company, Limited, against the Prescot Urban District Council in respect of a certain contract, which the defendants alleged was not binding upon them in consequence of its not containing a clause imposing a penalty in the event of its terms not being carried out. The facts of the case were briefly given in the JOURNAL for the 6th inst. (p. 298). The Divisional Court, it will be remembered, gave jugdment for the defendants; and the plaintiffs appealed. During the arguments on a previous day, it was stated that the defendants were willing to make the payments, but that the District Auditor and the Local Government Board had refused to sanction them. Thereupon the Master of the Rolls said it was just and right that the arrears should be paid; and if this opinion were intimated to the proper authority, the Local Government Board would doubtless allow them to be paid. He thought a new contract should be entered into containing a penalty clause. The matter was adjourned to enable the parties to go before the Local Government Board. Upon the case being called on again, it was stated that the Board would sanction the payment of the arrears; and it was arranged that a new contract should be entered into in substitution for the present one—its conditions to be settled, in case of disagreement, by some third party. Upon these terms, the appeal was dismissed.

At the meeting of the York Town Council on Monday evening last week, the electric lighting question, which has occupied their attention, on and off, for something like five years, was again under consideration. It came up on a report, presented by the Electric Light Sub-Committee of the Streets and Buildings Committee, which contained a recommendation that a tender submitted by the Electrical Construction Company for the supply of plant necessary for the electric lighting of the City, and working it, for £8650, should be accepted. The Sub-Committee had been in communication with four firms; but only two tenders had been received. Evidently, the Council are not all keen on having the new light, for two members sent letters to the Lord Mayor (the Right Hon. W. M'Kay) expressing regret at being unable to attend the meeting to urge their objections to the scheme. One condemned the system proposed to be adopted; and said if the light was to be made a success, it would have to be supplied at less than 6d. per unit, as suggested by the Sub-Committee. The other writer used rather stronger language. He deprecated the imposition of further charges upon the "already sadly overburdened ratepayers" for carrying out a costly electric lighting scheme. He continued: "With gas at the exceptionally low rate it is supplied at in York, and considering the immature and transitory condition of electrical engineering at the present time, I feel quite sure that the great majority of the ratepayers of the city would be content to wait further developments before they embarked on so expensive an experiment as electric lighting. Feeling confident that electric lighting costs nearly three times as much as the average cost of gas—notwithstanding plausible statements to the contrary—I am bound to oppose it at the present juncture." The writer concluded by referring to the figures showing the comparative cost of gas and electric lighting in the case of the Manchester firm cited in the JOURNAL for the 23rd ult.; and he also threw in a few significant remarks as to the Kingston-upon-Thames undertaking by way of example. He added that he did not hold a share in the York Gas Company—he only wished he did. These letters were read to the Council. When the subject came up, Alderman Agar moved the adoption of the report. He said the result of the Committee's consideration of the question was the recommendation that the tender of the Electrical Construction Company be accepted for seven years at 6½ per cent. on the capital outlay, and a charge of 6d. per unit. Something had been said about the charge at which the Company would supply the current. It would be to their interest to obtain as many customers as they could, and at as low a rate as possible. In order to make the electric supply a success, they had to charge a rate which would compete fairly with gas. Some had suggested that the question should be deferred; but if it was further postponed, there would be great danger of some company stepping in and doing the work instead of the Corporation. A very strong feeling had been expressed in the Council that undertakings of this kind should be municipalized; and they had now an opportunity of putting that advocacy into practice. Mr. Mann seconded the motion. He said there was not the slightest chance of additional burdens being put upon the ratepayers. The contractors proposed to give them a first-class installation; and when the Corporation had paid the money, they were guaranteed 6½ per cent. interest, and there would be no burden on the rates. The tender recommended by the Sub-Committee for acceptance was for £8650; and supposing the estimated £6000 was spent in road work and other expenses, the total cost would be £14,650. If they allowed the Company to have the working of the concern for three years, they would pay 6 per cent.; if for seven years, 6½ per cent.; and if for ten years, 7 per cent. The Sub-Committee recommended the medium time. The system was the alternate current; and it would enable any part of the city to be supplied from one station. Alderman Wragge characterized the scheme as about the worst that could be proposed. He said it was not only the immediate outlay that should be considered, but what it would accrue to in seven years. In Oxford, the system had cost £68,000. Mr. Purnell confirmed Alderman Wragge's statement. Mr. Scott said they had been "fooling around" the question ever since it had been referred to the Streets Committee. The members were afraid to consult an expert as to which was the best system for York. He proposed, as an amendment, that, in view of the fact that the scheme had been brought up with so little information, the opinion of Professor Kennedy be formally obtained as to which system he recommended. Mr. Mansfield seconded this proposition. Mr. Purnell thought an expert's opinion would in all probability be a biassed one. He considered the Committee had not approached the matter in the proper way. Alderman Wragge said they had had experts one after another; and, if they

wanted further advice, he objected to going to a gentleman they had had before. Other speakers having disapproved of the amendment, it was put and lost. Alderman Wragge then moved that the consideration of the question be adjourned. The Lord Mayor asked if the mover would specify any date. His question was met with cries of "*Sine die*;" and one member excited laughter by calling out: "For ever." The Lord Mayor then, like the lover in the ballad, tried to stop any further "shilly-shallying" by at once appealing to Alderman Wragge to "name the day." The worthy Alderman was equal to the occasion. He said he thought they should adjourn the question until they could ensure a good attendance; and he proposed the second Monday in October. Alderman Clayton seconded this amendment; but it was lost by a small majority. Mr. Shaftoe then moved to the effect that the report should be referred back to the Streets Committee, with instructions to consult an expert and report to an early meeting of the Council. Alderman Agar suggested that wider scope should be given to them than submitting to an expert only the two tenders sent in. Why should they not go broadly into the matter, get to know which was the best system, and then follow up with tenders and settle it? The Lord Mayor said the Council were in an extraordinary position. Alderman Agar had recommended them to accept a certain tender; and now he said it was possible the two tenders of which this was one were not the best. Could they wonder that the Council felt at a loss what to do under such circumstances? After some explanation from Alderman Agar, Mr. Shaftoe's amendment was put as follows: "That the matter be referred back to the Committee, with instructions to select an expert to advise them which system is the best; the Committee then to ask for tenders on such best system, and to report fully to an early meeting of this Council." Mr. Wrightson seconded the amendment, which was supported by Alderman Wragge. Mr. Mann said he wished the Council would either carry something or discharge the Committee. Simply because their pet tender or contractor had not been accepted, there were members who did not care what came first, and they wanted to throw the matter back. Alderman Coning thought it would be a mercy to discharge the Committee. He was never more ashamed of his connection with any Committee in his life than he was of this one, which had dallied with the thing for five years, and was not an inch nearer than it was two years ago. The amendment was carried. On being submitted as a substantive motion, an amendment was moved by Mr. Mann, and seconded by Mr. Gardiner, to the effect that the Streets and Buildings Committee be relieved from further duties in connection with electric lighting, and that a fresh Committee be nominated. This also was lost. Mr. Atkinson, in the course of some remarks, said that all the wriggling about that had been going on during the evening would be a disgrace to any Council, he did not care where it was. The display of ignorance was something painful. The position in which they were placed by the amendment was really humiliating. It was simply waste of time and money. The motion was carried by 15 votes to 11.

During a severe thunderstorm which occurred on the 10th inst., the electric light fittings in the Woodbourne Hotel, Douglas, Isle of Man, were destroyed. In this hotel, an arc lamp was supported on a flagstaff fixed on a turret. The flagstaff was struck by lightning, and the discharge went through the electric fittings (being the path of least resistance) to earth. Besides the destruction of the fittings, the ceiling of the billiard-room was set on fire, and several persons experienced severe shocks, though the building, as a whole, received little damage.

METROPOLIS WATER SUPPLY.

The Official Water Examiner's Report for June.

The report on the condition of the Metropolitan Water Supply during the month of June, by the Official Water Examiner (Major-General A. de Courcy Scott, R.E.), has just been issued. In view of the recent scarcity of water at the East-end, it may be of interest to give some figures from the report.

The Water Examiner states that the Thames Water at Hampton, Molesey, and Sunbury was in good condition during the whole of June. The water at its lowest point was 5 inches below the average summer level. The average daily supply delivered from the Thames during the month was 128,001,203 gallons; from the Lea, 58,894,236 gallons; from springs and wells, 45,331,111 gallons; from the ponds at Hampstead and Highgate, 5434 gallons. The last is used for non-domestic purposes only. The daily total was, therefore, 232,231,984 gallons for a population estimated at 5,506,862; representing a daily consumption per head of 42·17 gallons for all purposes. The relative proportions of the supplies from the above various sources were as follows: From the Thames, 55·12 per cent.; from the Lea, 25·36 per cent.; and from springs and wells, 19·52 per cent. The following statement compares, in the case of each Company, the number of gallons per head per day supplied during the month, with the number supplied during the same month of the previous year: Chelsea—June, 1895, 47·39; June, 1894, 42·35. East London—June, 1895, 42·77; June, 1894, 36·31. Grand Junction—June, 1895, 55·96; June, 1894, 50·64. Kent—June, 1895, 37·73; June, 1894, 31·14; Lambeth—June, 1895, 41·12; June, 1894, 32·95. New River—June, 1895, 36·39; June, 1894, 32·90. Southwark and Vauxhall—June, 1895, 45·87; June, 1894, 38·37. West Middlesex—June, 1895, 40·59; June, 1894, 34·35. In the following statement, the percentage of house supplies on the constant system in each Company's district on Dec. 31, 1894, and June 28, 1895, are compared: Chelsea—Dec. 31, 1894, 63 per cent.; June 28, 1895, 68 per cent. East London—Dec. 31, 1894, 99 per cent.; June 28, 1895, 99 per cent. Grand Junction—Dec. 31, 1894, 100 per cent.; June 28, 1895, 100 per cent.; Kent—Dec. 31, 1894, 69 per cent.; June 28, 1895, 75 per cent. Lambeth—Dec. 31, 1894, 63 per cent.; June 28, 1895, 64 per cent. New River—Dec. 31, 1894, 64 per cent.; June 28, 1895, 64 per cent. Southwark and Vauxhall—Dec. 31, 1894, 91 per cent.; June 28, 1895, 93 per cent. West Middlesex—Dec. 31, 1894, 65 per cent.; June 28, 1895, 65 per cent. The general result shows an increase up to the 28th of June to the extent of about 1988 in the number of houses on constant supply; making the total 652,313, or about 80 per cent. of the total number of supplies. From June 29 the East London Water Company ceased to supply water during the night to about three-quarters of the houses in their district. The Directors considered it necessary to take this step in consequence of the rapid depletion of the stored water which was taking place, and the continued absence of rain. The mains on which fire-plugs were fixed continued, nevertheless, to be constantly charged; and houses, the pipes of which communicate with these mains, continued to receive a constant supply.

Following Major-General Scott's report are those of Dr. E. Frankland and Professors Crookes and Dewar, which were given in the JOURNAL for the 30th ult.

The Supply of Water at the East-End.

A meeting of the Directors of the East London Water Company was held last Thursday, at the offices, St. Helen's Place, E.C., under the presidency of Mr. G. Banbury, the Chairman of the Board. Mr. W. B. Bryan, the Company's Engineer, reported that, notwithstanding the heavy rains of the latter end of the preceding week, only a slight increase had been notified in the volume of water stored in the several reservoirs of the Company. Since Tuesday, however, there had been an addition of upwards of 40 million gallons; and this, added to the increase in the storage of the past few weeks, justified the Directors in announcing a further addition to the number of hours of the intermittent supply. With respect to a statement which had been made that the death-rate in those districts supplied with water by the East London Water Company had greatly increased, Mr. Bryan pointed out that, according to the Registrar-General's latest returns, it was altogether contrary to facts. It had also been asserted that, in spite of the great scarcity of water in East London, the Company was selling every day to a "neighbouring Water Company" 4 million gallons.* This report, as the Directors knew, was perfectly untrue. In fact, the East London Company were purchasing a similar quantity from the New River Company every day. The Directors sanctioned the issuing of a notice to the inhabitants of East London to the effect that the water would be turned on about six a.m. and left on until about five p.m. daily, commencing on the 17th inst. Consumers were requested not to allow taps to run water to waste carelessly, as otherwise it might become necessary to again restrict the hours of supply.

The Secretary of the Company (Mr. I. A. Crookenden) has addressed the following letter to the Clerk of the County Council (Mr. H. De la Hooke): "I am desired by the Directors of this Company to acknowledge the receipt of your letter of 3rd inst., enclosing prints of Mr. Cripps's memorandum and of Mr. Binnie's report, both dated the 30th ult., and which were read to the London County Council at their meeting on that day. [See *ante*, p. 299.] In reply, I am to state that my Directors do not consider that either the memorandum of Mr. Cripps or the report of Mr. Binnie calls for any recognition or reply at their hands, as they are not concerned with any opinions which these gentlemen may have expressed to the London County Council. My Directors wish me to add that the Company's Solicitors have, in a letter published in *The Times* of the 8th inst. [*ante*, p. 354], shown the inaccuracy of Mr. Cripps's assertion, as also of the conclusions arrived at by Mr. Binnie."

In the course of an interview last Friday, Mr. Crookenden stated that what had been described as the "water famine" was undoubtedly over, and no further fears need be entertained by the East-end population as to the future supply of water. The printed notices that had been issued intimating the increase in the supply would be carried out to the strict letter. At present, the pipes and mains of the Company were in an excellent condition of repair, notwithstanding the severity of the winter and the allegations that had been made to the contrary. The real cause of the deficient supply in a majority of instances was the fracture, through the severe frost of last winter, of the private pipes conveying water from the Company's mains to the premises of the consumers. It had already been ascertained by Mr. Bryan, the Engineer to the Company, that no less than 40,000 of these fractures had taken place; and in only too many cases the owners of the house property, he regretted to say, had not yet made good the damage to the pipes. This alone, he added, would account for an enormous amount of waste.

A Petition to Parliament.

Last Friday, Mr. Percy Thornton, M.P. for Clapham, presented to Parliament a petition embodying resolutions on the London Water Supply which were adopted at a public meeting of householders and ratepayers of Clapham, held at the Clapham Assembly Rooms in June last. The resolutions expressed the opinion that in no case ought any company to have the power to charge for water not supplied to the consumer, unless by reason of some default on his part; that, in any future enactments relating to water companies, it shall be required that all existing mains be relaid, where necessary, at a sufficient depth to secure a full supply of water at all times of the year; that all service-pipes from the mains to the premises served, with all intermediate stopcocks and plugs, shall become the property of the companies; that all new service-pipes, with their stopcocks or plugs, be made, and the existing ones, where necessary, relaid at a sufficient depth, and repaired and maintained at the expense of the companies; and that all such mains, service-pipes, &c., be placed under the inspection of some independent body possessing parliamentary powers of supervision and requirement; that the charge for water made on the rateable value of premises shall include the cost of water for all domestic and sanitary purposes, including high service.

The "Surprise" Pendants.—Messrs. Best and Lloyd have just received advices that they have been awarded the Diploma of Honour at the Toulouse International Exhibition for their "Surprise" pendants; this being the highest possible award in the class in which they exhibited (Gas Lighting Apparatus). These fittings have also been selected for exhibition at the meeting of the Iron and Steel Institute now being held in Birmingham.

*The statement referred to was made in the *Daily Chronicle*.—ED. J.G.L.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

The Chief Engineer's Report on Available Sources of Water Supply.

In the JOURNAL for the 30th ult. (p. 248), we gave an outline of the scheme proposed by the Chief Engineer of the London County Council (Mr. A. R. Binnie, M.Inst.C.E.) for providing the Metropolis with an additional supply of water, to be obtained from Wales. The scheme is fully described by him in a report presented to the Water Committee, of which the following are the principal portions:—

I.—*Introduction and General.*

It will be within the remembrance of the Committee and those who have studied the recent inquiry of the Royal Commission on Water Supply, that the Thames basin down to the intakes of the Water Companies comprises an area of about 3542½ square miles, containing a present population of upwards of a million persons; and that upon this area the rainfall varies probably from 24 up to 30 or 32 inches—averaging possibly about 27 inches per annum. This is the total average rainfall of many years, making no allowance for long periods of dry weather or years of extreme drought; and the Royal Commissioners have stated that, with a certain but undefined storage, they consider that 300 million gallons a day can be obtained from the Thames, provided that certain important works of sanitation and regulation are undertaken, and that the storage provided be made sufficient to avoid the necessity of drawing on the river in periods of flood or of extreme drought. It will also have been observed that the water from the river will first have to be pumped into the reservoirs, where it will subside and be stored, and after filtration will again require to be pumped for the supply of the Metropolis.

It must also be borne in mind that the investigations of the recent Royal Commission under Lord Balfour of Burleigh were directed not to inquire into what was the best and cheapest possible scheme for the supply of London, but as to what were the capabilities of the Thames and Lea Valleys for the purposes of the Metropolis. The decision at which they have arrived, limited as it is by the very serious restrictions which they say should be enforced to secure the purity of the water and to prevent the depletion of the river, may be considered as the best that can be said for the Thames and Lea Valleys, irrespective of other sources of supply more or less distant from London; and one impression I think must be left upon the mind of the reader of that report—viz., that, under any circumstances, the consideration of some enlarged scheme of water supply must be undertaken within the next twenty years, as the valleys of the Thames and Lea become more thickly populated, and the sources spoken of by the Royal Commissioners approach exhaustion.

I hope to be able to point out, in what follows, that, by resorting to a district of greater rainfall, a much smaller area than the above will suffice for the purposes of Metropolitan supply, while giving ample compensation in water to the streams from which it is abstracted; and that the works can be constructed at such an altitude as entirely to avoid pumping, except for the small areas on the summits of Hampstead, Highgate, Shooter's Hill, and the Sydenham hills.

In laying out such a scheme, regard must be had, even in a district of large rainfall, to the incidence of the fall during the wetter months of the year; so that, by storing up the bountiful supplies of those months, we shall be able to provide against the drier months in such a manner as to ensure, both to the Metropolis and to the streams from which water is derived, a certain instead of a fluctuating flow, which at present in all cases takes place in the state of Nature—the result being that the great bulk of the rainfall passes from the ground in the form of floods during the wet months, not only in a useless, but often in a very harmful manner to the valleys below. For it must be remembered that water flowing from hilly and mountainous ground passes off with much greater rapidity after a fall of rain or the melting of snow upon the hills than it does in the Thames Valley.

My investigations into the flow of the River Thames clearly point out the exceedingly large amount of evaporation and absorption of the rain which falls during the months extending from March to November; and it is to counterbalance this, if the supply from the Thames is to be continued, that the construction of large storage reservoirs becomes a first necessity of the case. A requirement of paramount importance in the case of a new supply, after a heavy rainfall and sufficient altitude are secured, is that the geological structure of the country may be such as to be more or less non-absorbent. It can hardly be doubted that on the steep impervious slopes of clay, slate, and the Silurian formation generally, as well as on the cystalline rocks, a far larger proportion of the rain which falls, rapidly flows from the ground, and that the evaporation is consequently in all seasons reduced to a minimum quantity; whereas in the case of the Thames Valley we have seen that, fed as it is by the flat slopes of the porous beds of the chalk and the oolite, the evaporation during certain months of the year amounts to as much as 80 to 88 per cent. of all the rain that falls upon them.

In attempting to carry out the instructions of the Committee, it would be presumption in the time at my disposal to pretend that I could lay before them all the possible schemes that can be laid out in England for the supply of the Metropolis. But having been associated with the London Water Supply more or less since 1865, I have been able to form some kind of judgment of the district most suitable and most economical for the supply of the Metropolis. Having been engaged for some years in my earlier life on the setting out and construction of the Mid-Wales, and Neath and Brecon Railways, I am personally acquainted with the district to which in the first instance I propose more particularly to direct your attention.

As far back as 1862, I had observed the capabilities of the districts of the Wye, the Ithon, the Usk, and the Towy for a large supply of water to the Metropolis. It will be remembered that the late Mr. H. H. Fulton, M.Inst.C.E., laid before the Royal Commission of 1869 (the Duke of Richmond's Commission) a scheme for supplying London from the district of the Wye. But the project was only general in its character; and no detailed estimate was submitted to the Commission. In recent years, Messrs. Hassard and Tyrrell, MM.Inst.C.E., have laid before you (in various pamphlets) the suitability of the Usk and Wye sources; and in 1891 I was commissioned by your Committee to make a personal inspection of the Wye, the Usk, and the Towy, with their tributary streams. So that in this particular case I do not think anyone could claim priority in the suggestion, but that a concurrence of testimony, extending over many years, exists, that this area, drained by the above rivers, affords at all events a most suitable district from which a supply of water can be derived. It is, moreover, a district in a portion of which the Corporation of Birmingham are at present constructing works whence to draw their future supply; so that its general suitability to the purpose is well established. And as regards quality of water, there can be no doubt that, from its sparsely populated areas and steep mountain slopes, water can be obtained in every way desirable for the supply of a large population.

With regard to the question of hardness, which I need not point out is an all-important feature in the case, it will, I think, be found, as our investigations proceed, that the vast bulk of the water available will be soft water. The hardness of water generally depends on the amount of the salts of lime held in solution. It cannot be said that these salts of lime are injurious to health; but, on the other hand, a soft water supply lends itself with remarkable facility to all the purposes to which water is applied. Its cleansing properties as compared with hard water are enormously enhanced; its power of producing vegetable infusions, as in making of tea, &c., are greatly augmented; and it does not, in boiling, cause deposits of mineral matter which are so much to be avoided. Nor can its use be said to cause unhealthiness or disease among the people supplied. The experiment has been tried on a large scale by Aberdeen, Edinburgh, Glasgow, Liverpool, Manchester, Halifax, Bradford, Leeds, Sheffield, Belfast, Londonderry, Dublin, and many other towns. The places above enumerated alone contain a population of 5,318,200 people, the water supplied to whom is from 0·8° to 6·5° of hardness; and the health of these towns is in no way injured by the use of soft water.

It is a well-known fact that certain very pure and soft waters, such as distilled water and water derived from recent rainfall, act more or less energetically upon bright lead; and consequently some persons are inclined to assume that all soft waters are necessarily dangerous to health. But, although they so act on bright lead, they fail to do so when it is tarnished—in fact, such water tends to produce a coating which protects the lead. It is also a well-known fact that such waters when mixed with others, especially after filtration, cease to act on lead; so that I feel confident that no apprehension need be entertained on this point, more particularly when we take into account that such large towns as Manchester, Liverpool, Glasgow, Aberdeen, and Dublin are supplied with water of less than 2° of hardness, and that we have the recent case of Birmingham resorting to this very district to obtain a soft and pure supply of water.

Feeling, however, how important this question of the purity of the proposed water supply must always be, I have, after consultation with your Chairman, requested Mr. Dibdin, the Chemist of the Council, to himself visit the proposed sources of supply in Wales, collect samples, and make the necessary analyses. The general result of his investigations may be thus briefly stated: That the waters in question, running as they do in their natural state in the various rivers from which the samples were taken, are all of greater purity than the waters supplied to London after filtration, and remarkably so when considered from a bacteriological point of view. But this is not the whole of the advantage they possess; for, being drawn from mountain slopes, they are not liable in the future to be contaminated by animal or town refuse. So that the possible danger which must always hang over a water supply derived from such rivers as the Thames and Lea, which at present receive the drainage of nearly 1¼ million persons, who are rapidly increasing in numbers, will be avoided. Again, it is well known that all waters when stored in large volume improve by settlement and subsidence; so that the natural purity of the waters of these districts will be much enhanced by the storage to which they will be subject in the large open reservoirs, exposed to pure mountain air, to which I shall have to direct your attention in the course of this report.

Another characteristic of water is its colour when stored in large volume. When derived from areas of chalk and limestone in its greatest purity, it is, when viewed through a deep stratum, a slightly green, verging on a blue colour. In the case of waters derived from mountain drainage areas, they appear, owing to the presence of peat on the mountain slopes, at times, when viewed through a deep stratum, to present a clear crystalline, though slightly yellow, appearance. This tint, however, rapidly disappears when exposed to the action of light in large reservoirs. In other words, the water is bleached; and after filtration it betrays little or no trace of colour, until at a depth of 15 or 16 feet a small coin, such as a sixpence or a threepenny piece, can be clearly distinguished. These facts I have had occasion to study on the Bradford Water-Works, with which I was connected, as the Committee are aware, for many years.

Taking into account what I have said with regard to the rainfall and the necessity of ample storage, suitable reservoir sites are the first necessity of any scheme of this character. In this district, the geological character of the ground and the contour of the valleys lend themselves remarkably to the creation of large storage reservoirs. The character of the rock, being of the compact old red sandstone, Devonian, or Silurian type, at once affords water-tight basins in which the water can be stored; and various contractions in the valleys are of such a nature as to permit of dams or embankments being thrown across them so as to retain the water without the necessity of excavating—as has been proposed in the Thames Valley—huge ponds to contain water. And these reservoirs can be constructed at such an altitude as to enable the water to flow naturally into them, and by gravitation through masonry conduits and iron pipes, so as to be delivered on the northern and southern outskirts of London at such an altitude as to ensure at all times a gravitation supply under constant pressure.

In the construction of such an aqueduct as that which would be required from Wales, about 150 to 170 miles in length, economy in the of water is a prime necessity. Consequently, in laying out a line

of aqueduct from Wales, it is desirable so to design the works as to introduce as great a length of masonry aqueduct as possible for the purpose of economizing not only the head, but the cost of construction generally, as the necessary masonry of the aqueduct can easily be constructed at less expense than pipes of the required diameter to convey the same quantity of water.

I must here for one moment notice an objection which has often been raised to making a large city like London dependent on a long line of aqueduct for its water supply. I can but say that, if a supply of pure water is to be obtained, we must go to great distances to secure it; and that no danger is to be apprehended from so doing. Liverpool already draws water from the Vyrnwy by an aqueduct more than 77 miles long; Manchester will shortly draw its future supply from Thirlmere by an aqueduct 100 miles in length; and Birmingham is now constructing one 80 miles long from the Elan and Claerwen, in the Upper Wye Valley.

It may be said that, in case of war or civil tumult, a long aqueduct might be a source of danger to the community, as being likely to fall into the enemy's hands. This again is hardly a tenable position, when we consider the case of Paris—a city which within our own time has suffered a siege from a foreign invader, and a no less disastrous calamity from revolutionary tendencies among its own citizens. Yet we find the Paris water supply is derived from distances of as much as 80 to 100 miles. We can hardly, therefore, seeing that a conduit from Wales must of necessity pass through the centre of England, apprehend much danger under this head, as the supposed enemy to our water supply will have to take possession of the whole country north and south of the Thames before being in a position to cut off the water supply of London; and, as will be explained hereafter in the course of this report, I have so designed the works that the total quantity of 415 million gallons a day can be conveyed to London in two separate and distinct aqueducts. These, as will be described, can, if thought proper, be carried near to, and parallel with, each other; or, if thought more desirable for safety, they can be so located as to be many miles apart. This mode of treating the question also lends itself to economy in construction in the gradual development of the whole project. This, I think, will dispose of the fear which some might entertain in the event of the whole water supply of the Metropolis being dependent on one single line of communication.

I may also point out that, although Glasgow was originally supplied from Loch Katrine by a single aqueduct, opened in 1859, it has been found expedient within the last few years to duplicate this, by the construction of an entirely independent and parallel channel for the conveyance of water to the city, as it is obvious that it would be most expensive and inconvenient, if not impossible, to enlarge an existing aqueduct through which the water must continue to flow.

(*To be continued.*)

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A state of matters very satisfactory to the gas supply exists at Coatbridge, where Mr. T. Wilson is Manager of the Gas Company, which, by the way, is the only remaining gas company in Scotland which owns an incorporating Act of Parliament. In Coatbridge, an Electric Lighting Company was, a year or two ago, started under the special care of the greatest of all electrical scientists, Lord Kelvin; but notwithstanding this opposition, the business of the Gas Company goes on improving. During the past half year, the sales of gas increased by two million cubic feet over what they were in the corresponding period of the previous year. About 400 additional consumers of gas were obtained during the year, by the adoption of automatic prepayment meters, which have given every satisfaction, both to the consumers and to the Company. The Electric Lighting Company, though they sell their current at 5d. per unit, have only from 30 to 40 customers. They commenced business with a flourish of trumpets regarding the great things they were to do, by reason of their having adopted gas as the motive power for driving the dynamos. The gas was not that which Mr. Wilson's Company make and sell in the place, but was a special light manufacture of their own, which was produced by some of the water-gas methods, at a price which was to bring in a new era in electric lighting, by reducing the cost of current. But, from some cause which I do not know, the gas installation has been discontinued, and the motive power is now steam, which has been introduced at great cost, and which does away with the Company's prospect of revolutionizing the lighting problem. They also had the lighting of one of the streets in the town entrusted to them. But that also proved a failure; and the thoroughfare is now again lighted by gas. So long as Mr. Wilson can sell 26-candle gas at 3s. 4d. per 1000 cubic feet, he has nothing to fear from electricity, even though it be under the direction of one of the master-minds of the age.

From the report of the Gas Committee of the Kilmarnock Corporation, regarding their working for the past year, I learn that the gross revenue amounted to £14,260, and the gross expenditure to £13,303; leaving a profit on the year's operations of £957. There was a balance of £7752 at the credit of the profit and loss account at the beginning of the year, which raised the balance to £8709; and as only £169 was required to be provided, the balance of the profit and loss account is now £8540. The revenue from the sale of gas was £12,024, as compared with £12,256 in the previous year, which was considered highly satisfactory, as the price of gas was reduced from 3s. 4d. to 3s. 1½d. per 1000 cubic feet, and meter-rents were abolished. The mortgage debenture debt stands at the same as it was a year ago; but there is a balance at the credit of the sinking fund of £700. Coal carbonized amounted to 9250 tons, as compared with 9230 tons in the preceding year. The cost was £5839, against £5498. The output of gas was 87,874,000 cubic feet, an increase of 3,885,100 cubic feet; and the average yield per ton of coal carbonized was 9500 cubic feet. The leakage was 12 per cent., the same as last year. The tar produced amounted to 148,635 gallons, an increase of 6657 gallons over the previous year; and the revenue from same was £825, as compared with £656. There were produced 98 tons of sulphate of ammonia, a decrease of 2 tons; and the revenue under this head was £1042, or £808 less than in the previous year. The mortgage bonds upon the undertaking amount to £21,625; but against this, the assets amount to £25,736. The profit on the year's working was equal to 4¼ per cent. on the capital. I can only repeat what I wrote last year regarding the accounts, which are presented by Mr. W. Fairweather, the Manager, that they are remarkably full and clear, and that altogether nothing but congratulation is to be given to Mr. Fairweather for his manner of conducting the whole undertaking.

An enterprising Dundee newspaper has, "for the information of householders, who are always keenly interested in the question of public rates," put itself to the trouble to collect the prices at which gas is sold in the large towns in Scotland, and in places contiguous to their own city. Ten other towns, besides Dundee, are included in the list. In Dundee, the price remains at 3s. 4d., as last year; in Aberdeen, at 3s. 5d.; in Perth it has been reduced from 3s. 9d. to 3s. 6d.; in Edinburgh and Leith, from 3s. 6d. to 3s. 2d.; in Glasgow it is stated to have remained at 2s. 4d., but that is a mistake, as it was reduced from 2s. 6d. to 2s. 4d.; in Greenock it remains at 3s. 2½d.; in Forfar it has been reduced from 4s. 3d. to 3s. 9d.; in Arbroath it remains at 4s. 2d.; in Montrose, at 4s. 7d.; and in Broughty Ferry it has been reduced from 3s. 9d. to 3s. 4d. The compiler has been wonderfully accurate, having only, so far as I can perceive, as to price, made the one mistake which I have pointed out; and he, very strangely, has no recommendation to give to the Town Council or the "householders" for whose benefit the information has been collected. All the comment he makes is that it is found that, with the exception of Aberdeen, Dundee has to pay the highest price for its illuminant, while Glasgow is in the fortunate position of getting off cheapest; and that, among small places, Broughty Ferry possesses the lowest rental. "Of course," he added, "with gas, as with other things, quality was an important factor; but that aspect of the matter had not been touched, the financial standard being alone considered. However, it might be mentioned that, while in Dundee the illuminating power was generally equal to 25 candles, in Edinburgh and Glasgow it seldom exceeded 20 candles." That is the second mistake, for in Edinburgh during the whole of last year, the average illuminating power was nearly 26 candles, and in Glasgow it was about 22 candles. So far the compiler is moderate in his conclusions; but he has left out the town which, of all others, would have made his comparison of any value. I refer to Paisley, which is nearly as large again as Greenock, and where gas of 27-candle power is sold at as low a figure as 2s. 6d. per 1000 cubic feet. If he wished to give a comparison among small places, he might have mentioned Hamilton, which certainly has a population larger than Perth, and where gas of 27-candle power is sold at the price of 2s. 1d. per 1000 cubic feet. This would have been information which might have been appreciated by the householders; but it would possibly not come within his ken. At the same time, I scarcely see what good purpose is to be served by giving, if a comparison is attempted, such a limited one as the price only. There are so many matters which affect the working of a gas undertaking, that the price is by no means the only test of good management; and therefore any attempt to found conclusions upon the mere basis of price would be a mistake. The enterprise, therefore, of the *Dundee Advertiser*, unless it is to be followed up by something more exhaustive, may be looked upon as practically wasted.

It is reported that, by an explosion of gas in an electric lighting culvert at the junction of Ingram and Queen Streets in Glasgow, on Saturday night last, the cover of a manhole was blown off; but none of the passers-by were injured. The danger of these explosions is therefore not yet removed; but this incident would seem to point to their severity having been modified by the adoption of the precautions which have been recommended.

At Port Glasgow this week, the Gas Committee of the Corporation had under consideration the estimates of revenue and expenditure in connection with the gas department for the current year, in which a surplus is brought out of £317. It was resolved to reduce the price of gas for illuminating purposes from 4s. 2d. to 3s. 11d. per 1000 cubic feet, but that the price of gas for motive power should remain the same as at present—viz., 3s. per 1000 cubic feet.

It was reported to the Johnstone Town Council on Monday that the revenue in the gas department for the past year was £5132, of which £4586 was derived from the sale of gas, £379 from the sale of residual products, and £110 from coke and waste lime. There was an ordinary expenditure during the year of £3375, and a net loss of £97. The severe frost of the past winter, it was stated, cost the Commissioners £60 for repairs to mains and service-pipes. Johnstone is not unaccustomed to deficits.

Intimation has been given in the Millport Town Council by Commissioner Allan that, at the next meeting of the Council, he will move that the Commissioners adopt the Burghs Gas Supply (Scotland) Act of 1876.

The Dunbar Gas Commissioners have again come out badly with their year's working. Though they used to have profits ranging from £350 to £530, or thereabouts, they have this year a deficit of nearly £200. Last year they had a loss of about £80. The Commissioners have accordingly raised the price of gas from 5s. 3d. to 5s. 10d. per 1000 cubic feet. An ex-Convener of the Gas Committee urged them rather to reduce the price of gas to 5s., so as to encourage its use; but his advice was not heeded. I am not surprised at bad results in connection with the Corporation Gas-Works at Dunbar. The Commissioners do not work together; and it is therefore impossible that the department should flourish.

The output of gas in Perth still continues to rise. At the monthly meeting of the Gas Commissioners on Monday, it was reported that the quantity of gas manufactured during July was 3,903,000 cubic feet, or 635,200 cubic feet more than during July of last year. The average illuminating power was 25·53 candles. After deducting the quantity of gas made from oil, the amount derived from coal was at the rate of 10,505 cubic feet per ton. The illuminating power given above was that recorded inside the works. As showing how the gas manufactured from oil by the Peebles process affects gas supplies, in the matter of condensation, it may be pointed out that the return of the Gas

Examiner, taken out at the testing-station outside the works, gave an average illuminating power of 26·50 candles. I have before observed that the independent test in Perth, of gas which had been in store for some time, gave a higher illuminating power than was obtained by the Manager (Mr. Whimster) from gas tested while on its way to the holder. The Commissioners will meet on an early date to discuss Mr. Foulis's report on the proposal to remove the gas-works to a new site. A summary of the report was given in the JOURNAL last week.

When Mr. Forbes Waddell went to Forfar, less than a year ago, he had to make good his right, as Manager, to engage and dismiss men in the gas-works. He seems not only to have accomplished this, but to have also acquired power to put the Commissioners, his employers, to work. On Thursday he had some of them charging retorts. It is not said whether they laid the coal evenly; but it is recorded that, after they had concluded their labours, they assuaged their thirst with wines, and were fed upon cake. The occasion was the inauguration of a new setting of retorts which Mr. Waddell has just had erected. It is exceedingly pleasant to find the Commissioners taking so active an interest in the gas-works. Their presence at the inauguration is an earnest both of their desire to see the undertaking prosper, and of their wish to support the Manager in his efforts to improve the gas supply of the burgh.

Notices have been given by the Caledonian Electric Supply Company, of Glasgow, to the Town Councils of Perth and Montrose, of the intention of the Company to apply for Provisional Orders giving them the right to supply electricity for lighting in the burghs. In neither case do the local authorities appear to be very much frightened at the notices.

The West Kilbride Gas Company have this week been registered as a limited liability company, under the name of the West Kilbride Gas-light Company, Limited. The capital is £2500 in £1 shares. The Company's registered office is at Main Street, West Kilbride.

I have been asked to state, with reference to the death of Mr. Allan Gillespie, of Edinburgh, referred to in last week's JOURNAL, that the cause of death was an affection of the lungs, and was not due, as implied in the paragraph of last week, to other causes.

The annual accounts of the Denny and Dunipan Gas Commissioners show a revenue during the year ending May 15 last of £2086, of which £1784 was derived from the sale of gas; and there was a balance of profit of £14. The balance at the credit of the profit and loss account amounts to £1043.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 17.

Sulphate of Ammonia.—There has been a fair amount of business done during the week, induced, no doubt, by easier prices. Consumers seem to look for a still lower level; and they are not buying freely. But dealers have been availing themselves of the opportunity to cover their August sales; and any improvement would seem to depend upon the extent of their commitments. At the close, they appear rather indifferent about covering further. The quotations are £9 3s. 9d. Leith, £9 5s. Hull, and £9 7s. 6d. f.o.b. Liverpool. There is inquiry for forward delivery; but buyers' ideas are for the most part too low to induce business.

Nitrate of Soda is unchanged; and the spot value of fine quality is 8s. 3d. per cwt.

LONDON, *Aug.* 17.

Tar Products.—Benzol, toluol, solvent and heavy naphthas go from bad to worse. Buyers are continually clamouring for lower prices; and very little business is being done in them. There is a little more inquiry for carbolic acid; but there is no improvement in price. Pitch is firm; indeed, it is practically the only tar product that can be sold at all easily. Any collapse in the value of pitch (which may easily happen) would be disastrous for distillers in the present state of the other products. Tar would be of little value. Common tar oils are weaker. There is no change in anthracene. There is a market now for crude naphthalene, but at a price which does not pay to extract it from the oils. Quotations during the week are as follows: Tar, 17s. 6d. to 21s. Pitch, west coast, 35s.; east coast, 37s. 6d. to 38s. 6d. Benzols, 90's and 50's, 11d. Solvent naphtha, 1s. Toluol, 1s. Crude, 30 per cent., naphtha, 4½d. Liquid creosote, 1¼d. Naphthalene salts, 23s. 6d. Cresylic acid, refined, 1s. 1d.; brown, 11d. Carbolic acid, 60's, 1s. 6½d. Anthracene, "A" quality, 1s.; "B" quality, 9½d.

Sulphate of Ammonia is a little more sought after, but not to such an extent as so far to have improved its price. Transactions have been done during the week at £9 to £9 5s., less 3¼ per cent., according to port of shipment; while gas liquor is offered at 6s. 6d. to 7s. 6d. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Practically all the gas-coal contracts of any weight have now been settled, so far as this district is concerned, at about the prices previously given, with the exception of Salford, with reference to which I have not heard anything definite. The demand for all other descriptions of fuel shows no improvement. Pits are, as a rule, working scarcely more than half time; whilst some of the commoner mines are being closed for the present, owing to the exceedingly low prices ruling for the inferior descriptions. Steam and forge coals continue a drug; and the excessive competition of surplus supplies necessarily gives a weak and irregular tone to prices. Engine fuel meets with a moderate demand; collieries in this district having no difficulty in moving away their limited output of slack. There is, however, no scarcity of supplies; considerable quantities being now offered in this district from Yorkshire, with the result that prices, although fairly steady, are not more than maintained at about late rates. At the pit mouth, best Wigan Arley coal is quoted 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. to 8s. 6d.; common house-fire coals, 7s. to 7s. 6d.; ordinary steam and forge coals average about 6s.; and engine fuel, 3s. to 3s. 6d. for common slack, to 4s. 6d. and 5s. for best qualities. In the shipping trade, only a very slow business is reported; and orders can only be secured by quoting extremely low-cut prices—the average figures for ordinary steam coal being about 7s. 3d. to 7s. 6d. per ton, delivered at the Garston Docks or the High Level, Liverpool.

Northern Coal Trade.—There has been a considerable increase in the demand for coal in the past few days, especially for steam coal; but the rush seems to have now passed, and though the price is maintained there is not the advancing tendency that there was. Best Northumbrian steam coals are in most cases quoted at 9s. per ton f.o.b. There were, however, one or two sales as high as 9s. 3d. per ton; and as some of the producing collieries had a very long turn, the exact price was more a matter of bargaining than of any very settled market conditions. Second-class steam coals were relatively lower, at from 8s. to 8s. 6d. per ton f.o.b.; and steam smalls were tolerably abundant at from 3s. to 3s. 6d., according to quality. There is little alteration in the price of manufacturing coals. In regard to gas coals, there is an increasing demand, both locally and for shipment; and as the tendency of freights in the autumn is usually upwards, some of the large users of gas coals are stocking as freely as they can, so as to take advantage of the low freights that at the present time rule, and at the same time to accumulate a full stock of coals now that deliveries are under contracts that have low prices. For odd cargoes, the price of best Durham gas coals varies from about 6s. 3d. to 6s. 6d. per ton f.o.b., though in the case of one large producing firm 6s. 9d. per ton is asked—that firm having booked very heavy contracts. There is a rather better demand for smithy coals; the exports having been heavy. As regards coke, the local demand is fully up to the recent average; and the price varies from 13s. to 13s. 3d. per ton f.o.b. There is a slight increase in the production of gas coke; but it is well taken up, and the price shows no alteration this week.

Scotch Coal Trade.—There is a distinct improvement in the coal trade in Scotland. Values are not increasing much. But inquiries are more numerous; and the output is moving off well. Considering that many of the larger consumers of coal, and particularly the railway companies, have laid in large supplies, to enable them to tide over any future strike, the tone of the market is decidedly encouraging. Splint coal is not, as yet, sharing in the improvement. Small coal is in great demand. The prices quoted are: Main, 5s. 10d. to 6s. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s. (full); splint, 6s. 3d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week have amounted to 169,580 tons—a decrease upon the preceding week of 19,302 tons, but an increase, as compared with the corresponding week of last year, of 159,875 tons. For the year to date, the total shipments have amounted to 4,304,448 tons—an increase upon the quantity in the corresponding period of last year of 545,556 tons.

The Bolton Water Undertaking.—The members of the Bolton Corporation paid their annual visit to the water-works last Thursday week; and each was furnished with a concise report as to how the supply is derived, as well as information in regard to the holding capacity of the various reservoirs, and other interesting statistics. As previously explained in the JOURNAL, the Corporation derive their water supply from three separate places—Sharples, Heaton, and Entwistle. The supply is by gravitation; and the collecting-ground is chiefly moorland or high mountain pasture of the millstone grit formation. The water is filtered at Sweetloves and Heaton through a filtering area of 13,658 square yards; and it is delivered into the town pure at a high pressure with a constant supply. The following is a list of the reservoirs and their holding capacities in gallons: Belmont, 468 millions; Springs, 134 millions; Dingle, 79 millions; Sweetloves, 90 millions; Rumworth, 95 millions; Heaton, 91 millions; High Rid, 130 millions; Entwistle, 625 millions; Wayoh, 550 millions; and Crowthorn, 3½ millions. The annual statement of the Borough Finances just published by Mr. G. Swainson, the Borough Treasurer, says the water-works are slightly on the down grade; the revenue being £53,734 for the twelve months ending in March last, as against £55,903 in the previous year. In fact, the meter supply is less than has been the case since 1890; probably due to the fact that the Local Boards of Leigh and Hindley are now obtaining their water from other sources. As the result of the reduced income, the profit transferred in aid of rates is only £10,000, as against £12,000. The additional capital expenditure on the works last year was £5331.

Wolverhampton Corporation Water Supply.—At the quarterly meeting of the Wolverhampton Corporation on Monday last week, the Water Committee presented their report, with the accounts for the year ending the 31st of March last. The profit, after paying interest charges on the capital, and providing for the sinking fund, amounts to £4675 4s. 7d. The income from the sale of water was £501 in excess of the previous year. The surplus of £3000 shown in the revenue account will be forthwith transferred to the credit of the improvement fund, in accordance with the resolution of the Council of the 11th of March last. With the approval of the Council, and subject to parliamentary sanction, an agreement has been entered into with the Urban District Council of Bilston for the sale to them of the water rights and mains of the Corporation in the Coseley area, and the water-main from Goldthorn Hill to the boundary of the township of Bilston, for the sum of £7750. In the latter part of last year, a complaint was preferred by the County Council of Salop, under the Highways and Locomotives (Amendment) Act, 1878, against the Corporation, for expenses incurred by them in repairing damages caused by "extraordinary" traffic conducted thereon by the Corporation. On the case being heard before the Shifnal Justices, they found that the traffic was extraordinary within the meaning of the Act; but they stated a case for the opinion of the High Court of Justice. The Divisional Court upheld the decision of the Justices. The number of houses in the municipal borough of Wolverhampton is estimated at 17,970, of which 17,320 are supplied from the Corporation water-works. There are, therefore, about 650 houses the inhabitants of which depend upon wells for their supply, or obtain it in some other way. There are outside the borough 8675 houses served with Corporation water, exclusive of those supplied through the Bilston Commissioners. The number of meters in use by consumers is 406.

Leeds Gas Stokers and their Work.—It having been discovered that the conditions of labour agreed upon between the Leeds Corporation and their gas stokers, after the dispute some few years ago, are not being quite carried out, and that the men are, on an average, only carbonizing 52·2 cwt. instead of 60 cwt. of coal per shift, the Gas Committee have decided to have the coal for each man properly weighed in future.

The Proposed Water Trust for West Kent.—Our local correspondent writes: "Whatever may be the result of the Bills promoted by the London County Council, the local authorities in West Kent are evidently determined that, now they have entered upon the work necessary for the formation of a Water Trust, not to turn back. A Committee has been established on which all the District Councils interested are represented; and at a meeting held recently it was resolved as follows: 'That, in the opinion of this meeting, the Kent authorities within the area of supply of the Kent and Lambeth Water Companies should promote a Bill for the constitution of a Water Trust and the purchase of the Kent Water Company's undertaking and so much of the Lambeth undertaking as is situate within the county of Kent.' 'That such authorities be recommended to hold the necessary meetings, and pass the necessary resolutions for this purpose.' 'That, if it be found advisable to do so, the Kent County Council be asked to promote such Bill, on their being indemnified by the authorities interested, or a majority of them; and that the expense of such promotion be borne jointly by the said authorities in proportion to the rateable value of the districts included in such area of supply, and be repaid out of money to be borrowed under the powers of the Bill.' Of course, before the West Kent authorities or the County Council can promote a Bill in Parliament, it will be necessary to obtain the sanction of the ratepayers in public meeting; and arrangements are being made to comply with the provisions of the Borough Funds Act in this respect."

Projected Extension of the Walsall Gas-Works.—At the last quarterly meeting of the Walsall Town Council, the Gas Committee reported that, if the demand for gas increased as it had done for the last five years, about £50,000 would shortly be required for new plant and buildings; and they recommended the Council to apply to the Local Government Board for alterations and additions to the local Acts and Provisional Orders, so as to allow of the borrowing of that sum. The report of the Borough Auditor (Mr. G. R. Ridsdale) was appended. It stated that the value of the gas sold to private consumers was £6970—an increase of £250 as compared with the corresponding quarter of last year. In reply to Mr. Hughes, the Town Clerk (Mr. Cooper) explained that the further capital for the gas-works was for additions which were expected to be required in the next few years. If the increase of the last five years was maintained, they would have by the winter of 1897 to put up new retort-benches and a new gasholder and tank. The latter would cost about £16,000; and the additions to the retort-house about £12,000. They had purchased six acres of land to add to the works; and this would have to be enclosed and workshops put on it. Beyond this, they had erected a retort-house twice as large as they originally intended; and, in consequence, had an overdraft of £10,000 on their capital account. Mr. Clare urged that the matter should be adjourned for a year, in order that the Council might see what was the effect of the electric light undertaking. It was pointed out by several members that the money would not be sanctioned probably until next year, and then it could not be spent without coming again before the Council; while the works would take some years to carry out. Immediate application had, therefore, better be made. The Town Clerk stated that the increase in the demand for gas last quarter was 15 per cent. over the corresponding quarter of 1894. The recommendation was agreed to; Mr. Clare alone voting against it.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 383.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	23–24	..	4 7 6
100,000	10	,,	7½	Do. 7 p. c.	10	15½–16½	..	4 10 11
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106–108	+2	4 12 7
200,000	5	10 May	6½	Bombay, Limited	5	7–7⅛	..	4 6 8
40,000	5	,,	6½	Do. New	4	5–5⅛	..	4 14 7
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258*	+2	4 13 0
180,000	,,	,,	9	Do. New	100	200–210*	+2	4 5 8
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	227–232	..	4 14 10
888,500	Stck.	28 Feb.	5	Bristol	100	125–130	..	3 16 11
320,000	20	28 Mar.	11½	British	20	54–56	..	4 0 4
50,000	10	14 Mar.	11½	Bromley, Ordinary 10 p. c.	10	22–23	..	5 0 0
51,510	10	,,	8½	Do. 7 p. c.	10	17–18	..	4 14 5
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	7¾–8¼	..	4 14 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	28–30	..	5 10 0
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	299–304	..	4 8 9
165,000	,,	,,	10½	Do. New o.	100	225–230	..	4 11 4
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	265–275	..	4 14 6
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	203–208	..	4 16 2
535,000	Stck.	28 Feb.	5¼	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25–26	..	4 4 7
354,060	10	,,	11	Do. Partly paid		7¼ 17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12¾	Gaslight & Coke, A. Ordinary	100	292–297*	+1⅜	4 5 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112*	+2	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	280–285*	+2	3 10 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135*	+2½	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197–202*	+3⅜	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	187–192*	+2	3 12 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	277–282*	+2	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	163–168*	+1	3 11 5
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	131–134	..	2 19 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140–145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	200–205	..	2 18 6
3,800,000	Stck.	10 May	12	Imperial Continental	100	249–254	–1	4 14 5
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	5½–6½	..	4 16 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p.c. Deb.	100	115–117	..	4 5 6
541,920	20	12 June	5	Monte Video, Limited	20	16½–17½	..	5 14 3
150,000	5	24 May	8	Oriental, Limited	5	7¼–7⅜	..	5 3 2
60,000	5	28 Mar.	7	Ottoman, Limited	5	5–5⅛	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	102–106	..	5 13 2
500,000	100	4 June	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	26 Apl.	7	San Paulo, Limited	10	10–11	..	6 7 3
500,000	Stck.	14 Feb.	15½	South Metropolitan, A Stock	100	355–365	..	4 4 11
1,350,000	,,	,,	12	Do. B do.	100	305–310	..	3 17 5
308,685	,,	,,	13	Do. C do.	100	315–320	+5	4 1 3
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	172–176	..	2 16 10
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	290–295	..	3 7 10
1,719,514	Stck.	10 Apl.	8	East London, Ordinary	100	228–233	–2	3 8 7
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	115–120	+1½	2 18 4
708,000	Stck.	14 Feb.	12	Kent	100	309–314	+2	3 16 5
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	260–264	..	2 16 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	208–213	..	3 10 5
330,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	145–150	..	2 13 4
500,000	100	14 Aug.	12⅜	New River, New Shares	100	385–395*	+1½	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143–145	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	157–163	..	2 9 1
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	292–297	..	3 7 4

*Ex div.

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*** See Advertisement p. II., centre of JOURNAL.

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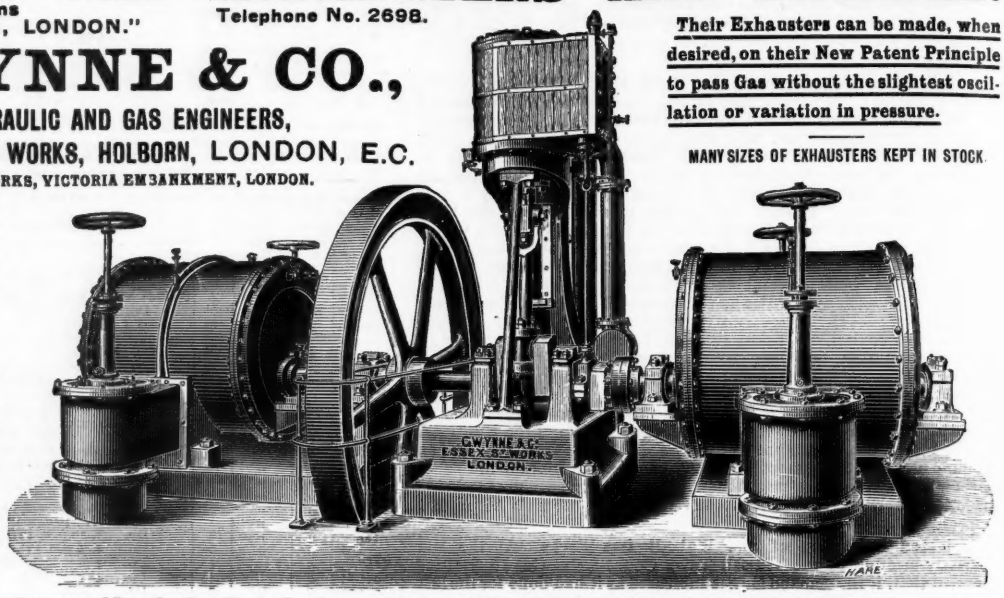

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Applicant must be thoroughly qualified; have had experience in Management of Works with Regenerative Retorts; and understand the Chemistry and Testing of Gas. He must state previous Situations, Age, and Salary expected.
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THE Corporation of Halifax are in want of a FOREMAN STOKER at their Gas-Works.
Applications are to be made in the handwriting of the candidate, stating Age, Experience, and giving three References to character and ability; and are to be addressed to the undersigned not later than the 24th inst. Wages £2 2s. per week of seven eight-hour shifts.
THOS. HOLGATE, Gas Engineer.
Gas-Works, Halifax,
Aug. 15, 1895.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Gloucester Gas-light Company invite TENDERS for the surplus TAR produced at their Works for One, Two, or Three Years, from the 1st day of October next.
The Tar will be delivered into Boats or Barges at the Company's Wharf, on the Gloucester and Berkeley Canal.
Offers to be at per ton of 200 Gallons, and per ton by weight.
Payments, cash monthly.
Further Particulars may be obtained on application to Mr. R. Morland, the Company's Engineer.
Sealed tenders, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, Eastgate, Gloucester, to be delivered not later than Wednesday, the 28th day of August inst.
The Directors do not bind themselves to accept the highest or any tender.
By order,
WILLIAM E. VINSON, Secretary.
Gas Offices, Gloucester,
Aug. 8, 1895.

SMETHWICK GAS-WORKS.

OXIDE OF IRON.

THE Gas Committee invite Tenders for the supply of 50 Tons of OXIDE OF IRON, delivered at Soho Station (L. & N.W.Ry.) or Handsworth Station (G.W.Ry.).

Sealed tenders, endorsed "Tender for Oxide," addressed to the Chairman of the Gas Committee, to be delivered to the undersigned, at the Public Buildings, Smethwick, on or before the 26th inst.

W. J. STURGES,
Secretary.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation invite TENDERS for the supply, in whole or in part, of 32,000 Tons of GAS COAL for the Year ending Sept. 30, 1896.

Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.

Tenders, sealed and endorsed "Tender for Gas Coal," to be sent in not later than Noon of the 28th day of August, 1895, addressed to M. B. Dodds, Esq., J.P., Town Clerk, Stockton-on-Tees.

The Gas Committee do not bind themselves to accept the lowest or any tender.

WM. FORD,
Engineer and Manager.

Stockton-on-Tees,
Aug. 7, 1895.

SPALDING GAS-WORKS.

THE Spalding Urban District Council invite TENDERS for the supply of 2000 Tons of the best NEWCASTLE GAS COAL and 500 Tons of the best screened SILKSTONE GAS COAL or NUTS (or any larger quantity of either kind that may be required), to be delivered in such quantities as shall be from time to time required and ordered by them, or by their direction, up to the 30th day of June, 1896.

Sealed tenders, to be endorsed "Tender for Coals," stating the price per Ton delivered f.o.b. in the Tyne or at the Spalding Railway Station, to be sent to the undersigned at the Office of the Council, 8, Double Street, Spalding, on or before the 21st day of August inst.

The Council do not supply Forms of Tender.

The Council will also receive TENDERS at the same time for the supply of 20 Tons, or any greater or less quantity that may be required, of LIME suitable for Gas Purification, to be from time to time delivered at Spalding Gas-Works, in such quantities as shall be required up to the 30th day of June, 1896.

The Council do not bind themselves to accept the lowest or any tender.

H. H. HARVEY,
Clerk to the Council.

Spalding, Aug. 13, 1895.

SOUTH ESSEX WATER-WORKS COMPANY.

NOTICE is Hereby Given, that an ORDINARY GENERAL MEETING will be held at the Guildhall Tavern, 81, Gresham Street, E.C., London, on Saturday, the 31st day of August, 1895, at 11.30 a.m., to consider the Directors' Report and to pass Resolutions thereon, and the declaration of Dividends.

The TRANSFER BOOKS ARE CLOSED until after the Meeting.

C. J. FOX,
Secretary.

Offices: Romford,
Aug. 14, 1895.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 31st day of August inst., at half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare Dividend, for the Election of Two Directors and an Auditor for the ensuing Year, and for transacting General Business.

The TRANSFER BOOKS for CONSOLIDATED STOCKS WILL BE CLOSED from the 17th inst. to the 2nd of September next, both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 9, 1895.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 22nd day of August inst., at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditor, to declare Dividends, to elect an Auditor, and for General Purposes.

NOTICE IS ALSO GIVEN, that at such Meeting RESOLUTIONS will be submitted to create further SHARE CAPITAL, under the Provisions of the Bromley Gas Act, 1879, by the issue of New Ordinary Shares of £10 each, not exceeding in the whole 1000 of such Shares, and to raise, by the creation of Debenture Stock, instead of borrowing on Mortgage, such further Sum as is capable of being so raised, and to authorize the Directors to issue such Shares and Stock, at such times, upon such terms, in such manner, and subject to such conditions as they may think fit.

The TRANSFER BOOKS WILL BE CLOSED from the 8th to the 22nd of August, 1895, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: At the Works, Bromley,
Kent, Aug. 6, 1895.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

"BEAR CREEK" CANNEL.

LOG MOUNTAIN COAL, COKE, AND TIMBER CO.,
PINEVILLE, KENTUCKY, U.S.A.
Cable Address: "Hull, Pineville."

LONDON AGENTS:
W. J. WILSON & Co., Suffolk House, Cannon St., E.C

GAS PURIFICATION.

Best Absorbent of Sulphuretted Hydrogen, &c.

JAMES E. CAMPBELL,
Patentee and Manufacturer,
96, MILL STREET, BRADFORD, MANCHESTER.

PRICES, &C., ON APPLICATION.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

> "The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

> The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) **FAITHFULL & OWEN,**
Solicitors for the Incandescent Gas-Light Company, Limited.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY, LIMITED,

GUARANTEES FIDELITY.

Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.

HEAD OFFICE:
49, CHANCERY LANE, LONDON, W.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

INCANDESCENT MATERIALS

OF THE VERY BEST QUALITY FOR
Lighting Power and Burning Permanence.
Recommended to Wholesale Buyers.
IN ANY QUANTITY.

Supplied by the
INTERNATIONALE GLÜHKÖRPER COMPAGNIE,
ARNHEIM, HOLLAND.
WRITE FOR SAMPLES.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . .	11,205 Cubic Feet.
Illuminating Power, 16 7/10	Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. Per Ton.
Sulphur	A little over 1 Per Cent.
Ash	Under 1 Per Cent.
Tar	163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . .	10,500 Cubic Feet.
Illuminating Power .	17 Stand. Sperm Candl.
Coke (of excellent quality) .	13½ Cwt. Per Ton.
Sulphur	1·13 Per Cent.
Ash.	1·34 Per Cent.
Tar.	180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

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LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

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Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

LOW MOOR BLACK BED GAS COAL.

YIELD OF GAS PER TON	10,375 CUBIC FEET.
ILLUMINATING POWER	17·50 SPERM CANDLES.
COKE	75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,

RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co. Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

See Advertisement in last and next issue.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

FITTER.

AUSTRALIAN BOGHEAD.

Practical Results in Ordinary Working:—

Gas per Ton	15,100 Cub. Ft.
Illuminating Power	45·6 Candles.

For Samples and Prices, f.o.b. London or c.i.f. to Continental Ports, apply to

THOMAS RAISON & Co.,

117, LEADENHALL STREET, E.C.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE

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KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co LIMITED,

BARNSLEY;

Or to **Mr. W. H. HARVEY,**

17, Old Queen Street, Westminster, S.W.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

PIPES, 2-in. to 8-in.
2-in. **PIPES,** to 8-in.
2-in. to 8-in. **PIPES.**

MONIER-WILLIAMS & Co.
IRONFOUNDERS,
MIDDLESBROUGH.

ECONOMIZE £16 per RETORT per ANNUM by the USE of RETORTS of REDUCED THICKNESS fitted with

GUEGUEN'S COMPENSATING HELICOIDAL RIBS.

NO OUTLAY OF CAPITAL.
NO ALTERATION IN SETTINGS.
APPLICABLE TO ALL RETORTS.

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Engineer,
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Inquiries from Retort Makers will be Esteemed.

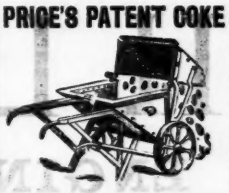
A FREE TRIAL FOR ALL.
Agents Wanted.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.
For Particulars, Price, &c., apply to Mr. E. Price, Inventor and Patentee, 119, Queen's Road, Finsbury Park, N.
Prices are Reduced.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
Coal Owners, Newcastle-on-Tyne;
or
E. FOSTER & CO.,
21, John Street, Adelphi, London, W.C.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
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J. & H. ROBUS,

ENGINEERS & CONTRACTORS FOR GAS & WATER WORKS,
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RETORT-SETTING & Gaseous Firing a Speciality.

MAIN LAYING,

AND THE ERECTION OF GAS AND WATER PLANT OF EVERY DESCRIPTION,
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GASHOLDER TANKS.

Established 20 Years.

WILLEY & CO.

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Central Works: Commercial Road, EXETER;

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Metropolitan Agent: CAPTAIN ACLAND, M.Inst.M.E., Assoc.M.Inst.C.E., DOCK HOUSE, BILLITER STREET, LONDON.

Manufacturers of every Requisite for Gas-Works.

Specialities: GASHOLDERS, GAS-METERS, GAS-FITTINGS.

WILLEY AND CO. beg to announce that they have recently acquired the Sole Right and Proprietorship of the

"SIMPSON"

Automatic Penny-in-the-Slot Meter

(By Royal Letters Patent),

An application of the "Vernier Principle," ensuring Mathematical Accuracy of Registration, combining all the latest Scientific Improvements.

PRICE INSTANTLY, SIMPLY, & READILY ADJUSTED *IN SITU*, BY SINGLE FEET OR HALF FEET, WITHOUT CHANGE OF WHEELS.

STRENGTH, DURABILITY, & MINIMUM SIZE.

AMPLE WARNING & GRADUAL EXTINCTION.

BASE OR MISTAKEN COIN DETECTED & RETURNED.

Terms on Application.

NEW CATALOGUE OF GAS-FITTINGS of novel and registered designs, with Special Quotations to Gas Companies, now in the Press for early circulation.

Agents for the "MAXIM PATENT CARBURETTOR" New Process of Gas Enrichment by Carburine.

Price 21s., Post Free,

PRECEDENTS IN
PRIVATE BILL LEGISLATION
AFFECTING GAS AND WATER UNDERTAKINGS, 1879-90.
Compiled by E. H. STEVENSON & E. K. BURSTAL.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

PETTIGREW'S PATENT
Sulphate of Ammonia Plant
ON THE CONTINUOUS SYSTEM
Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.
Old Systems easily and cheaply converted.
ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.
Write for Particulars, Testimonials, and References to
GEO. PETTIGREW & Co.,
GAS AND CHEMICAL ENGINEERS,
MIDDLESBROUGH-ON-TEES.

BOWENS' Ltd. Successors,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to
THOMAS BUGDEN, Manufacturer,
71, GOSWELL ROAD, LONDON, E.C.

"CANNELINE" FOR ENRICHING COAL GAS.
Superior to the very Volatile Hydrocarbons; requiring only a simple apparatus, at quite a nominal cost.
Coal Gas enriched by "CANNELINE" shows conclusively this Hydrocarbon is vastly superior to all other Enriching Agents, including Cannel Coal.
For all Particulars, apply to
S. BOWLEY & SON, Wellington Works, BATTERSEA BRIDGE, LONDON.

GASHOLDERS
OF ALL SIZES.
C. & W. WALKER,
Midland Iron-Works, Donnington, near Newport, Shropshire; and 10, Finsbury Square, London.
Telegraphic Addresses: "Fortress Donnington, Salop;" "Fortress, London."

HUTCHINSON BROTHERS,
GAS ENGINEERS, &c.,
MANUFACTURERS OF

Improved Wet & Dry Gas-Meters.
STATION-METERS. LAMP-METERS.
Test Gasholders and General Gas Apparatus.
Brass Main & Lamp Taps. Unions, Ferrules, &c.
The "Falcon" Lamplighter's Torch. Service Cleansers.
SYPHON AND OTHER PUMPS.
WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.
WET AND DRY METERS REPAIRED.
FALCON WORKS, BARNSLEY.
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ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brussels	700,000 Cub. Ft.
Belfast	1,700,000 ,,	Liverpool	2,500,000 ,,
Glasgow	300,000 ,,	Tottenham	600,000 ,,
Santiago	400,000 ,,	Brighton	1,250,000 ,,

And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Manchester	3,000,000 Cub. Ft.
Swansea	700,000 ,,	Bath	1,000,000 ,,
Preston	1,500,000 ,,	New York	1,000,000 ,,
Southport	750,000 ,,	Newburgh	350,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. Telegrams: "EPISTOLARY, LONDON." *United States Office, 64, Broadway, New York.*

HOUSE'S CEMENT

USED BY 350 GAS-WORKS.

HOUSE'S

For High Pressures, Cylinder Covers, Steam, Gas, and Water Socket and Flange Manholes.

A Month's free trial.

JOINTING CEMENT

1 cwt. equals 3 cwt. of RED LEAD.

& TANNIC COMPANY, LTD.,

The Ancient Philosophers thought and Cudgelled their Brains with

WHAT IS HOUSE'S TANNIC COMPO. "K.O."?

It will pay you to inquire when you want your Boilers cleaned and you suffer with incrustation.

NO CURE. NO PAY.

A Free Trial to Engineers, Gas Companies, and all Steam Users.

NORTH WORKS, RIPON.

A SCIENTIFIC INVENTION.

ABOUT Not made by Rule of Thumb.

HOUSE'S BELT Better Power and goes farthest, Cheapest and Best. Free from Resin.

DRESSING

Send for Circular and Particulars for Black Belts.

1 Gallon does the same Work as 56 lbs. of other mixtures.

LONDON AGENTS:
Bale & Co., 120, Newgate Street, E.C.

THE

DE MARE INCANDESCENT GAS-BURNER,

SPECIALLY ADAPTED FOR

DOMESTIC & STREET LIGHTING.

REQUIRES NO CHIMNEY, AND CAN BE USED IN THE ORDINARY

COMET GLOBES.

GIVES A VERY HIGH ILLUMINATING POWER.

The DE MARE COMPANY inform **GAS ENGINEERS** and others that they **will shortly be in a position to supply the above Burners; due notice of which will be given in the JOURNAL.**

THE

DE MARE INCANDESCENT GAS-LIGHT SYSTEM, LTD.

TEMPORARY OFFICE:

111, PALACE CHAMBERS, WESTMINSTER, S.W.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS.

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON OFFICE:
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GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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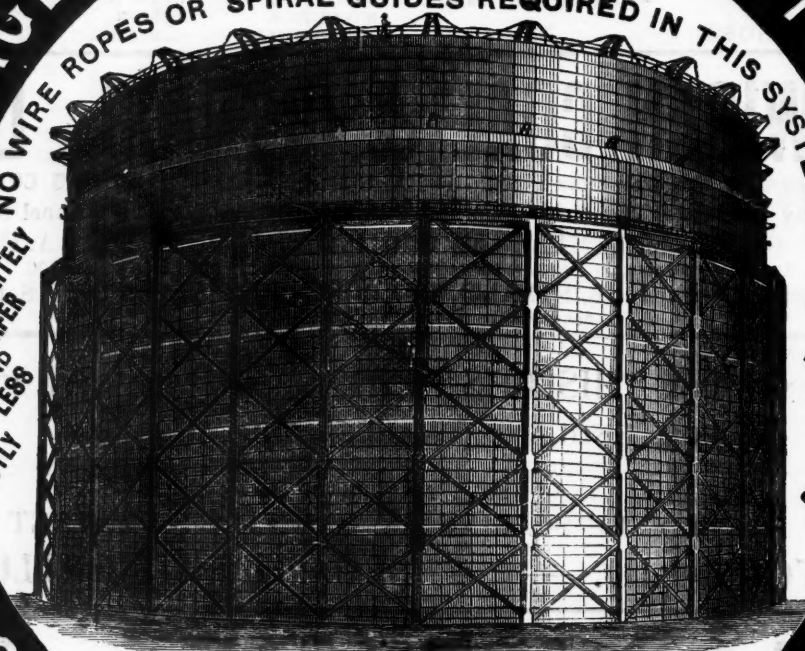

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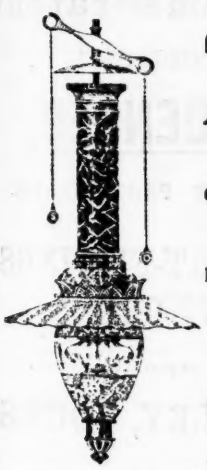

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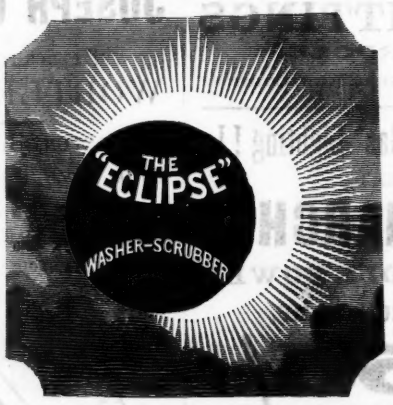

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